CANADA

DEPARTMENT OF FORESTRY

ANNUAL REPORT

of the

FOREST INSECT AND DISEASE SURVEY

FOREST ENTOMOLOGY AND
PATHOLOGY BRANCH

1961

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Published on the Authority of the Hon. Hugh John Flemming
Minister of Forestry · Ottawa, Canada

CONSERVATION ENTOMOLOGICAL
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ROGER DUHAMEL, F.R.S.C.
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FOREWORD

A brief summary of changes in senior staff members and facilities of the Forest Insect and Disease Survey follows, together with a synopsis of the major insect and disease problems of 1961.

Mr. D. M. Holden was appointed to the Corner Brook Laboratory and assumed responsibility for the Forest Disease Survey in Newfoundland. The Fredericton Laboratory has temporarily lost the services of Dr. D. C. Eidt, who accepted an assignment with the F.A.O. in Nigeria. The Disease aspects of the survey in the Maritime Provinces was strengthened with the addition of Mr. A. W. Chiko. Mr. K. R. Elliott, formerly of the Sault Ste. Marie Laboratory, assumed leadership of the Forest Insect Survey for the Manitoba-Saskatchewan Region.

The most important change in facilities in 1961 was the completion of a new laboratory at Winnipeg which provides vastly improved accommodation for the Survey group. In Alberta, a new ranger cabin was completed at the Mount Eisenhower Field Station and will serve as headquarters for the National Parks District. The Motor Vessel Forest Biologist, which has been used for surveys along the coast of British Columbia, was replaced by two smaller and faster cabin cruisers. These, together with more extensive aerial surveys, will provide better coverage of the coastal region, and allow more efficient use of field personnel.

High temperatures and serious drought prevailed for the second year over most of central Canada and the Atlantic Provinces. This resulted in the worst fire season on record, but had no immediate widespread effects on insect and disease conditions. Other weather extremes such as hail, wind, and late spring frost caused damage to foliage and affected tree growth in local areas of Canada. The details are discussed in individual regional reports. A condition usually described as "dieback of balsam fir" has been reported from parts of New Brunswick, Nova Scotia, and Ontario. The symptoms are dying of terminals and branches, followed by general chlorosis of the foliage, and finally a distinct reddening of the entire crown. The causes are not fully understood, although a number of fungi have been associated with affected trees. Some observers feel that the condition may be delayed effects of previous spruce budworm attack, or of the recent prolonged drought. The disease appears to be spreading and more intensive investigations of the problem are planned for 1962.

The spruce budworm, the forest tent caterpillar, and the larch sawfly were the major forest insect problems of national status in 1961. Details of outbreaks appear in the individual regional reports, but main features are reviewed below.

There was little change in the spruce budworm situation in the Atlantic Provinces. Minor outbreaks were reported in the St. Georges District of Newfoundland and Victoria County, Nova Scotia. In New Brunswick, high population levels were again restricted to the central part of the Province where approximately 2 million acres were sprayed. The general pattern for the past four years in this region has been a decline of outbreaks and egg surveys indicate this trend will continue in 1962. Similar trends have been reported in the Lower St. Lawrence and Gaspé regions of Québec. The small residual outbreak in the Kedgwick-Mistigougèche-Patapedia area was sprayed in 1961 and a further reduction in budworm numbers is forecast. Two major infestations of the spruce budworm continued in northern Ontario, but showed only slight increases in area. The larger covered about 6500 square miles in the Fort Frances District and the southwestern part of the Port Arthur District. The smaller covered

approximately 500 square miles and is in the south-central part of the Geralton District. The relatively small, but persistent outbreaks along the northern boundary between Manitoba and Saskatchewan and along the Liard River in the Northwest Territories continued and showed some increases in extent and severity. Along the Mackenzie River, budworm numbers declined to the lowest levels recorded since the outbreak was first detected in 1955. The one-year-cycle budworm was common in sections of British Columbia and caused severe defoliation in the Kitimat area. The very severe two-year-cycle budworm outbreak in the Prince George and Prince Rupert districts declined and reduced defoliation is expected during the flight year in 1962.

The larch sawfly was reported in all regions except British Columbia and outbreaks showed various trends. Population levels in western Newfoundland declined but increased in the central area. Defoliation was observed in most counties of New Brunswick and Nova Scotia, but insect numbers were generally low. The sawfly was recorded for the first time since 1939 in Prince Edward Island. Further increases were reported in central and eastern Quebec, but the sawfly was less abundant in the north. A general pattern of decline was also evident in northern sections of Ontario, Manitoba, and Saskatchewan where outbreaks have persisted for a number of years. Conditions elsewhere in these provinces showed little change. Further increases in the area and severity of larch sawfly attack were reported in Alberta and severe infestations now extend almost to the British Columbia boundary.

Extensive forest tent caterpillar outbreaks continued to develop in several parts of Canada. Moderate to severe defoliation of trembling aspen occurred over large areas in northern Alberta, Saskatchewan, and Manitoba. Many small, but severe infestations were reported in northwestern Ontario, but population levels declined in the Sudbury District. A general increase in abundance was recorded at several locations in British Columbia. Egg surveys and light trap collections indicate that further extensions of the forest tent caterpillar outbreaks mentioned above can be expected in 1962.

One of the major functions of the Survey is to detect and record changes in the distribution of introduced forest insects and diseases. Some of the more noteworthy developments in 1961 were: the appearance of the balsam woolly aphid in central Newfoundland, and the extension of known limits in western Newfoundland, northern New Brunswick, and British Columbia; the discovery of Dutch elm disease in two additional counties of New Brunswick, and in three additional counties of southern Ontario; the continued eastward spread of the European pine sawfly and the western extension of records of the European spruce sawfly in Ontario; additional collections of willow blight in British Columbia; and definition of the limits of the European pine twist rust which was first recorded in British Columbia in 1960.

In 1961, personnel attached to the Forest Insect and Disease Survey published a number of articles in scientific journals and in the Bi-Monthly Progress Report of the Forest Entomology and Pathology Branch. These outline the results of research and detailed surveys of many insect and disease problems. A list of these articles appears below and copies may be obtained from the authors or the undersigned.

Béique, R. Étude sur la mouche-à-scie du peuplier, *Trichiocampus viminalis* (Fall.) (Hyménoptère: Tenthredinidae). Can. Ent. 93:1085-1097. 1961

Bourchier, R. J. Two new imperfect fungi from the heartwood of living lodgepole pine. Can. J. Bot. 39:1781-1784. 1961.

Cuming, F. G. The distribution, life history, and economic importance of the winter moth, *Operophtera brumata* (L.) in Nova Scotia. Can. Ent. 93:135-142. 1961

Drouin, J. A., B. B. McLeod, and H. R. Wong. A rounded-headed borer in the root collars of poplars. Bi-monthly Progress Report 17(2). 1961.

Eidt, D. C. Distinguishing the larvae of three pupal parasites of *Argyresthia laricella* Kft. Can. Ent. 94:32-34. 1962.

Elliott, K. R. and J. A. Drouin. An infestation of a tube making tortricid in jack pine in Saskatchewan. Bi-Monthly Progress Report 17(5). 1961.

Lejeune, R. R. and G. T. Silver. Parasites and hyperparasites of the satin moth, *Stilpnotia salicis* Linnaeus (Lymantriidae) in British Columbia. Can. Ent. 93:456-467. 1961.

Lindquist, O. H. *Zeiraphera* and *Griselda* on spruce in Ontario. Bi-Monthly Progress Report 17(2). 1961.

Lindquist, O. H. A shoot moth on jack pine in Ontario. Bi-Monthly Progress Report 17(2). 1961.

Lindquist, O. H. and W. L. Sippell. Bud miners, *Argyresthia* spp. on spruce and balsam fir in Ontario. Bi-Monthly Progress Report 17(1). 1961.

Martineau, R. A new looper infestation in sugar maple stands in Quebec. Bi-Monthly Progress Report 17(5). 1961.

Molnar, A. C. and C. B. Cottrell. A whole bark method of rearing *Dryocoetes confusus* Sw. Proc. Ent. Soc. B.C. 57:16-20. 1960.

Molnar, A. C., G. W. Wallace, and R. G. McMinn. Surveys of *Poria* rot in second-growth Douglas fir stands. Bi-Monthly Progress Report 17(2). 1961.

Ouellette, G. B. and G. Bard. Notes on the occurrence of Armillaria root rot. Bi-Monthly Progress Report 17(6). 1961.

Pomerleau, R. History of the Dutch elm disease in the Province of Quebec. For. Chron. 37:356-367. 1961.

Raymond, F. L. and J. Reid. Dieback of balsam fir in Ontario. Can. J. Bot. 39:233-251. 1961.

Reid, J. and L. T. White. Chemotherapy and Dutch elm disease. Bi-Monthly Progress Report 17(4). 1961.

Robinson, R. C. and G. D. Paul. Miscellaneous new records of fungi occurring on pine in Alberta. Bi-Monthly Progress Report 17(3). 1961.

Ross. D. A. and D. Evans. Annotated list of forest insects of British Columbia. Part X—Notodontidae. Proc. Ent. Soc. B.C. 58:30-32. 1961.

Silver, G. T. Notes on chemical control of *Ectropis crepuscularia* Schiff. at Kitimat, B.C. Proc. Ent. Soc. B.C. 58:13-16. 1961.

Silver. G. T. Chemical control of loopers in Stanley Park, Vancouver. Proc. Ent. Soc. B.C. 57:58-60. 1960.

Sippell, W. L. Extensions of infestations of the European pine shoot moth. Bi-Monthly Progress Report 17(5). 1961.

Sippell, W. L. Key to the puparia of common dipterous parasites of the forest tent caterpillar, *Malacosoma disstria* Hbn., in Ontario. Can. Ent. 93:433-436. 1961.

Sippell, W. L. and O. H. Lindquist. The Nantucket pine tip moth in Ontario. Bi-Monthly Progress Report 17(5). 1961.

Watson, W. Y. and W. L. Sippell. Scolytid vectors of the Dutch elm disease in Ontario. Can. Ent. 93:403-405. 1961.

Ziller, W. G. Pine twist rust (*Melampsora pinitorqua*) in North America. Pl. Dis. Reporter 45:327-329. 1961.

Ziller, W. G. Pear rust (*Gymnosporangium fuscum*) in North America. Pl. Dis. Reporter 45(2) 90-94. 1961.

The second volume of a series of national compilations entitled "Forest Lepidoptera of Canada" is in press and will be available for distribution this year. This volume includes the families Nycteolidae, Noctuidae, Notodontidae, and Liparidae. Volumes 3 and 4, which will complete the series, are in preparation and will be completed in 1962.

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PROVINCE OF NEWFOUNDLAND

FOREST INSECT SURVEY

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INTRODUCTION

The summer of 1961 was highlighted by significant increases in numbers of several important forest insect pests. The balsam woolly aphid continued as a major threat to balsam fir trees with important extensions of boundaries of the western infestation and a new outbreak in central Newfoundland. Larch sawfly numbers declined in the west, but increased in the central region. The hemlock looper was present in major infestation proportions in five localized areas, and moderate to severe attacks of the spruce budworm and balsam fir sawfly were recorded. There was a noticeable increase in numbers of less important forest pests, such as the mountain ash sawfly, spiny elm caterpillar, and tussock moth. Satin moth infestations occurred in all parts of the Province except the Northern Peninsula, and small numbers of fall webworm were collected for the first time since 1955.

Survey personnel assisted Dr. C. F. MacLeod in releasing the shrew, *Sorex cinereus cinereus* Kerr., in two new locations in central Newfoundland. Studies on the effect of the shrew on the larch sawfly in St. Georges' District were continued and similar investigations were initiated in the new release areas. Biological and ecological studies of the balsam fir sawfly were continued.

Acknowledgment is made of the assistance provided by the pulp and paper industries and the Provincial Forestry Branch in supplying aircraft for aerial surveys and the United States Air Force for providing boats for surveys on Grand Lake.

A total of 1,358 collections were received at the laboratory. The distribution of collections by principal host trees was as follows:

Coniferous Trees	Collections	Broad-leaved Trees	Collections
Balsam fir	420	Willow	76
White spruce	215	Trembling aspen	70
Black spruce	177	Alder	67
Larch	159	White Birch	63
Red pine	3	Mountain ash	39
Scots pine	3	Dogwood	15
Others	1	Cherry	11
		Poplar	7
		Yellow birch	3
		Elder	3
		Elm	1
		Oak	1
		Others	24
Total	978	Total	380
Grand total			1,358

IMPORTANT INSECTS

Balsam Woolly Aphid, *Adelges piceae* (Ratz.)—In western Newfoundland infestation boundaries extended from four to ten miles in the Grand Lake and Deer Lake watersheds. The total infested area is now nearly 3,000 square miles

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(see accompanying map). The eastern boundary extends from Isle aux Morts on the South Coast along the western slopes of the Long Range Mountains, around Little Grand Lake and about three miles inland on Lewachenjeesch Brook and then along the eastern slopes of the Grand Lake basin. The northern boundary extends from Hinds Brook, Grand Lake, to Junction Brook near Reidsville to Cormac and then in a four- to five-mile strip along the west side of Deer Lake and Humber Arm, and long the coast to Trout River. Within this general area there is an uninfested section of about 300 square miles south of Corner Brook and west of Grand Lake.

Population levels were low in the older infestations but very high in the recent outbreaks where injury was severe in 1961. An indication of the rapid development of the Humber Valley outbreak is shown by survey plot records near Steady Brook. In 1959, 72 per cent of the trees showed no visible injury while in 1960, five per cent were uninjured and in 1961 only one per cent. Trees in the moderate to severe damage class changed from one per cent in 1960 to 29 per cent in 1961. This condition developed despite an overwintering aphid mortality of 60 per cent on the branches and 40 per cent on the stems. Mortality evidently resulted from a sustained period of cold weather in February and March when minimum temperatures ranged from 0°F. to −22°F.

In eastern Newfoundland, infestation boundaries remained approximately the same as in 1960. On the Avalon Peninsula, most of the balsam fir stands north of a line from Seal Cove to Witless Bay were infested. On the Burin Peninsula the outbreak was roughly triangular in shape extending from Burin Inlet northwest to Garnish and northeast to Red Harbour.

The most significant development of the season was the discovery of an infestation of about 300 acres near Norris Arm in central Newfoundland. A cutting and slash-burning control operation has been undertaken in the infested area.

The biological control program was continued and four species of predators in the following numbers were introduced in the Humber Valley: *Adalia conglomerata* L. (67); *Pullus impexus* Muls. (131); *Laricobius erichsonii* Rosen. (1,271); *Cremifania nigrocellulata* Cz. (39).

In July, D. G. Bryant recorded fairly large numbers of larvae of *Laricobius erichsonii* Rosen. attacking aphids on the stem and branches of balsam fir trees in the Steady Brook area. In August, 50 adults of the same species were taken in window traps up to one and one-half miles from the nearest release site. This predator is becoming well established and is evidently effective against both stem and branch populations. Other recoveries of introduced predators were as follows: Ten larvae of *Pullus impexus* Muls. from two branch samples at South Brook, 100 feet from the release site; and over 60 *Neoleucopis obscura* Hal. up to 30 miles from the release site. Cecidomyiid adults collected at Frenchman's Cove near release sites of *Aphidoletes thompsoni* Möhn have not been identified.

The native predator, *Tetraphleps americana* Pars., was fairly common in all areas and early instar larvae were recorded feeding on aphid eggs.

Hemlock Looper, *Lambdina fiscellaria fiscellaria* (Guen.)—Increases in the population level of this important pest have been noted for the past three years. In 1959 and 1960, small infestations less than one square mile in area occurred in central and western Newfoundland, and both were terminated by cutting the infested stands. In 1961, severe infestations occurred near McIvers, in the Humber District; at Little Bonne Bay Pond and Eastern Arm, in the St. Barbe District; and near Mings Bight and Middle Arm, on Baie Verte Peninsula. Light infestations were reported near Hawkes Bay and Portland Creek, in the St. Barbe District (see accompanying map).

The McIvers infestation covered about two square miles and current defoliation of mature balsam fir trees was about 60 per cent. Defoliation of the

understory was as high as 80 per cent. Near Little Bonne Bay Pond the infestation covered about six square miles and current defoliation ranged from 50 to 75 per cent. Two square miles of immature white spruce and balsam fir stands were infested near Lomond, and current defoliation was estimated at 75 per cent. The Mings Bight infestation was reported by a Geological Survey party and later observed from the air. This infestation has persisted for three years and now covers from five to eight square miles. From 60 to 70 per cent of the trees in the area have been completely defoliated. Two separate infestations were recorded near Middle Arm—one about two square miles, the other about one square mile. The outbreaks near Hawkes Bay and Portland Creek were not noticeable from the air. Defoliation was light and the red needles had disappeared before the survey was made.

The previous hemlock looper outbreak in Newfoundland terminated in 1954 after killing approximately 500,000 cords of mature balsam fir. These outbreaks were terminated by natural control factors, such as parasites, disease, and starvation.

		Larvae per tree sample	
Reports	Collections	Av.	Dev. from 1960
6	68	2.2	+1.2

Spruce Budworm, *Choristoneura fumiferana* (Clem.)—Spruce budworm numbers increased sharply in St. George's District but remained at about the same level in other areas. Nearly 3,000 larvae were collected, almost twice the number in 1960. Larvae were most numerous in the western coastal region from Doyles to Port au Choix. A moderate to severe infestation occurred near Stephenville in approximately 15 square miles of white spruce and balsam fir. Loss of current foliage ranged from 40 to 60 per cent in some stands and from 80 to 90 per cent in others. Other small pockets of light infestation with defoliation ranging from 15 to 20 per cent were recorded in June. Resampling in July showed that budworm numbers had been reduced and many dead larvae and pupae were collected. Dead and dying larvae were also common in the Stephenville infestation. In laboratory rearings, 18 per cent of the material was parasitized and 20 per cent died from other causes. Most of the balsam fir in the severe outbreak area is also infested with balsam woolly aphid.

Egg mass sampling yielded from 200 to 300 egg masses per 100 square feet of foliage in the Stephenville area and from 5 to 30 egg masses in other areas of the west coast. These data indicate that 1962 population levels will remain high near Stephenville and Port au Port but will be light to moderate in other areas. It is difficult to forecast the long-term trend of the infestation. An outbreak in St. Barbe District in 1955 also developed suddenly and terminated after only two years' duration without killing any trees.

		Larvae per tree sample	
Reports	Collections	Av.	Dev. from 1960
18	215	4.7	+2.1

Balsam Fir Sawfly, *Neodiprion abietis* complex—An outbreak of this sawfly covering approximately five square miles developed in stands of immature balsam fir trees in the Awachenjeech Brook area near Gallants. Loss of old foliage ranged from 50 to 70 per cent in the centre of the outbreak and from 10 to 50 per cent around the peripheral area. Defoliation of new foliage was negligible. Light to moderate defoliation covering a few acres occurred on the east side of George's Lake, near Rocky Brook. A previous outbreak in the same general area terminated in 1956 without significant tree mortality, largely through the action of parasites and disease. Outbreaks of this sawfly normally last about three years and remain quite localized. A few larvae and cocoons

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were collected from balsam fir in the White Bay and Green Bay districts and along the Lady Slipper Road near Corner Brook.

Reports	Collections	Larvae per tree sample	
		Ave.	Dev. from 1960
2	185	39.3	+25.1

Black-headed Budworm, *Acleris variana* (Fern.)—Population levels were lower in eastern Newfoundland than in 1960. Larvae were still common in parts of the Avalon Peninsula, especially near Windsor Lake and Chamberlains, but current defoliation was less than 20 per cent. Larval numbers increased in western Newfoundland but loss of foliage was negligible.

Reports	Collections	Larvae per tree sample	
		Av.	Dev. from 1960
2	175	1.7	+0.3

Spruce Budmoth, *Zeiraphera ratzeburgiana* Ratz.—Larvae were collected on white spruce from Isle aux Morts to Flat Bay Brook, but defoliation was less than five per cent of the current foliage.

Reports	Collections	Larvae per tree sample	
		Av.	Dev. from 1960
2	78	4.8	−0.5

European Spruce Sawfly, *Diprion hercyniae* (Htg.)—Larval numbers were generally lower than in 1960 except in the Serpentine, Baie Verte, Springdale, and Birchy Lake areas where from 10 to 15 larvae per tree sample were collected. Dead and diseased larvae infected with the virus introduced in 1947 and 1948 were common in collections.

Reports	Collections	Larvae per tree sample	
		Av.	Dev. from 1960
2	130	2.0	−1.1

Yellow-headed Spruce Sawfly, *Pikonema alaskensis* (Roh.)—Large numbers of larvae were collected from black spruce regeneration in the Cormack and Taylors Brook areas for the fourth consecutive year. New infestations were recorded on young spruce in old burns west of Indian Brook, Green Bay, and about three miles west of Main Dam. In the Cormack area, defoliation generally ranged from 5 to 30 per cent, although on several trees it was as high as 90 per cent. At Indian Brook and Main Dam, defoliation estimates ranged from 5 to 40 per cent.

Reports	Collections	Larvae per tree sample	
		Av.	Dev. from 1960
3	40	4.2	+1.5

Larch Sawfly, *Pristiphora erichsonii* (Htg.)—Population levels increased in central Newfoundland, but declined in most parts of western Newfoundland. Defoliation estimates ranged from 20 to 95 per cent over about 10 square miles along the Halls Bay Road, and from 75 to 95 per cent near Millertown and Exploits Dam. In western Newfoundland, defoliation ranged from 10 to 40 per cent except near Birchy Lake where it was 75 per cent in an immature stand.

Cocoons were again planted to assess the value of predation by the shrew, *Sorex cinereus cinereus* Kerr., in the St. George's release area. Cocoons examined after a three-month period yielded the following data: 22 per cent were chewed by the shrew and the larvae eaten; 23 per cent were missing and presumed to represent the combined work of mice and shrews. Other causes of cocoon mortality were: Parasitism, 19 per cent; insect predation, 7 per cent; mouse predation, 3 per cent; other causes, 2 per cent. Two more releases of shrews were made in

central Newfoundland. Twenty individuals were released on the Halls Bay road about 25 miles from Badger on July 19, and 23 were released near Exploits Dam on September 14. Both colonies originated in the St. George's study area. Dr. C. F. MacLeod reports that the original release near St. George's has been very successful. Population density is 15 per acre and the shrew has dispersed up to 10 miles from the release site.

		Larvae per tree sample	
Reports	Collections	Av.	Dev. from 1960
9	76	16.6	−10.3

Larch Casebearer, *Coleophora laricella* (Hbn.)—Except for a few scattered localities where light to moderate browning was reported, case-bearer numbers have been very low since 1951. Noticeable browning of larch foliage was recorded this year near Doyles in western Newfoundland, at Roberts Arm in central Newfoundland, and near Manuels in eastern Newfoundland where defoliation ranged from 20 to 30 per cent over about 10 square miles.

Reports	Collections
2	61

Satin Moth, *Stilpnotia salicis* (L.)—Large numbers were recorded in nearly all areas of the Province except the Northern Peninsula. In most cases ornamental poplars were infested and defoliation ranged from light to about 95 per cent. One infestation occurred in a two-acre natural stand of trembling aspen about 25 miles from Badger on the Halls Bay Road. Defoliation ranged from 20 per cent at the periphery to 95 per cent at the epicentre.

		Larvae per tree sample	
Reports	Collections	Av.	Dev. from 1960
8	25	6.8	−14.2

Birch Casebearer, *Coleophora fuscedinella* (Zell.)—Noticeable browning of foliage of white and yellow birch and speckled alder was recorded in the Codroy Valley for the second consecutive year. The species was also common throughout most of the Humber District, but caused no noticeable injury.

Poplar Leaf Roller, *Anacampsis innocuella* (Zell.)—Light injury to aspen was recorded throughout central Newfoundland, especially in the Halls Bay, Bishop's Falls and Point Leamington areas.

Reports	Collections
2	6

Birch Leaf-mining Sawfly, *Heterarthrus nemoratus* (Fall.) and ***Birch Leaf Miner,*** *Fenusa pusilla* (Lep.)—Light to moderate browning of the foliage of young white birch trees occurred in central and western Newfoundland. Injury was most noticeable in the Notre Dame Bay, Stephenville and Corner Brook areas.

Reports	Collections
3	27

Willow Sawfly, *Nematus limbatus* Cress.—Defoliation of willow by this species was common throughout western Newfoundland. The most severe injury occurred east of Birchy Lake and near Corner Brook where loss of foliage ranged from 60 to 90 per cent.

Reports	Collections
3	4

Spiny Elm Caterpillar, *Nymphalis antiopa* (L.)—Larval colonies occurred on willow and trembling aspen at Corner Brook, Pasadena, Deer Lake, and Sops Arm. This is the first record of occurrence of this species since 1952.

Reports	Collections
1	13

Willow Leaf Beetle, *Chrysomela falsa* Brown—This beetle caused defoliation of willow and trembling aspen in central and western Newfoundland. A severe infestation on willow occurred over a three-acre area near Main Dam. Loss of foliage was estimated at 90 per cent.

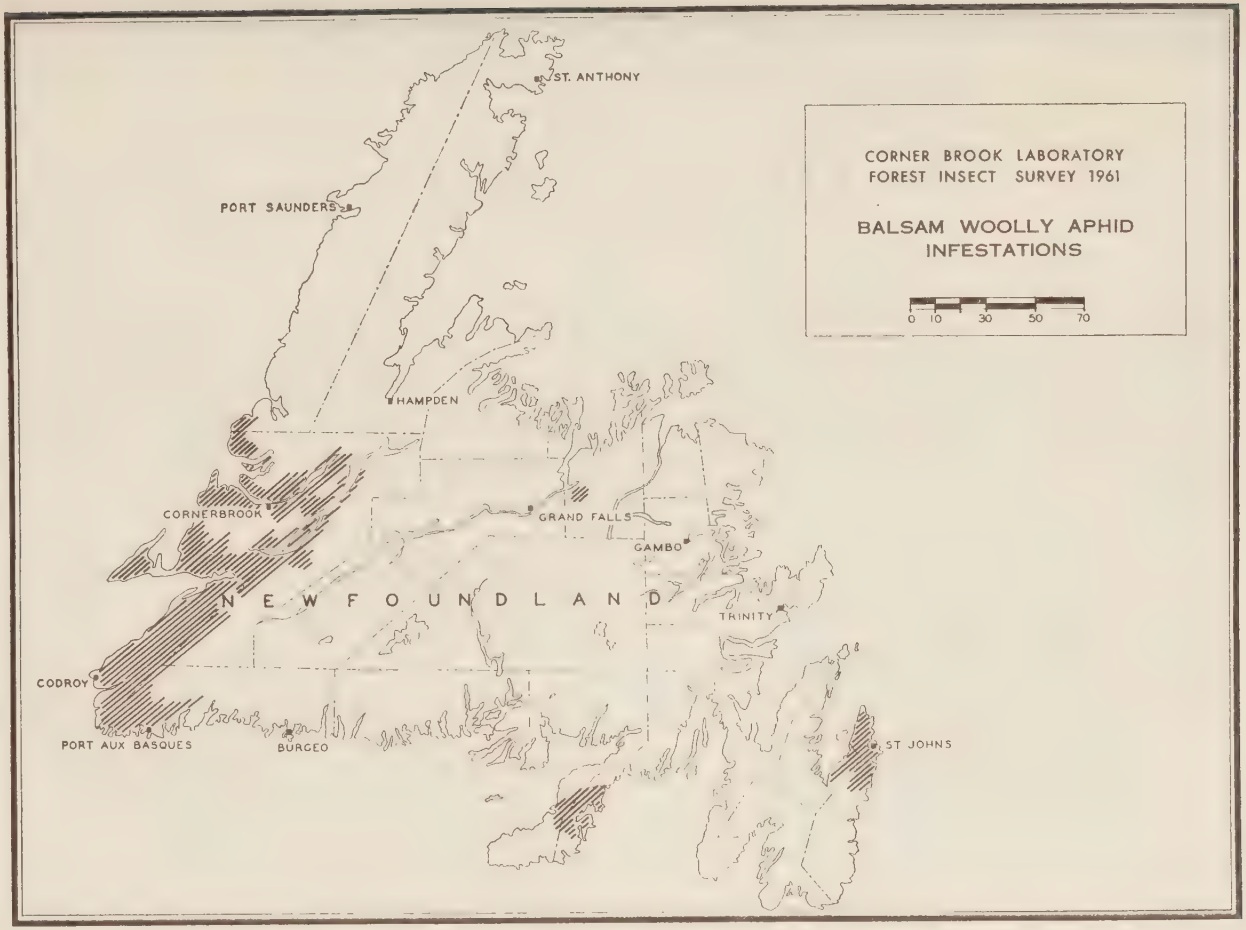
Reports	Collections
7	74

Mountain Ash Sawfly, *Pristiphora geniculata* (Htg.)—Severe defoliation of mountian ash was reported from the east coast near St. John's. Complete loss of foliage was noted on scattered trees in central and western Newfoundland.

Reports	Collections	Larvae per tree sample	
		Av.	Dev. from 1960
5	37	37.1	+0.1

OTHER NOTEWORTHY INSECTS

Insect	Host	Locality	Remarks
Adelges abietis (L.) Spruce aphid	Spruce	St. George's and Humber districts	Higher numbers than in 1960
Fenusa dohrnii (Tischb.) Alder leaf miner	Alder	Grand Falls	Moderate to severe browning
Hylobius sp., prob. *warreni* Wood	Scots pine	Burin Peninsula, Salmonier Line	Samples and reports of injury; first record from Burin Peninsula
Hyphantria cunea (Drury) Fall webworm	Birch and Alder	St. George's District	First collections since 1955
Orgyia antiqua (L.) Rusty tussock moth	Balsam fir	Bay d'Espoir	Reports of injury near Bay d'Espoir
Phenacaspis pinifoliae (Fitch) Pine needle scale	Spruce	St. George's and Humber districts	Less noticeable than 1960
Rhyacionia buoliana (Schiff.) European pine shoot moth	Ornamental pines	Eastern and western Newfoundland	Damage reports about the same as 1960
Undet. Lacebug, prob. *Corythucha pruni* O. & D.	Alder and Willow	Central Newfoundland	First record—light to moderate injury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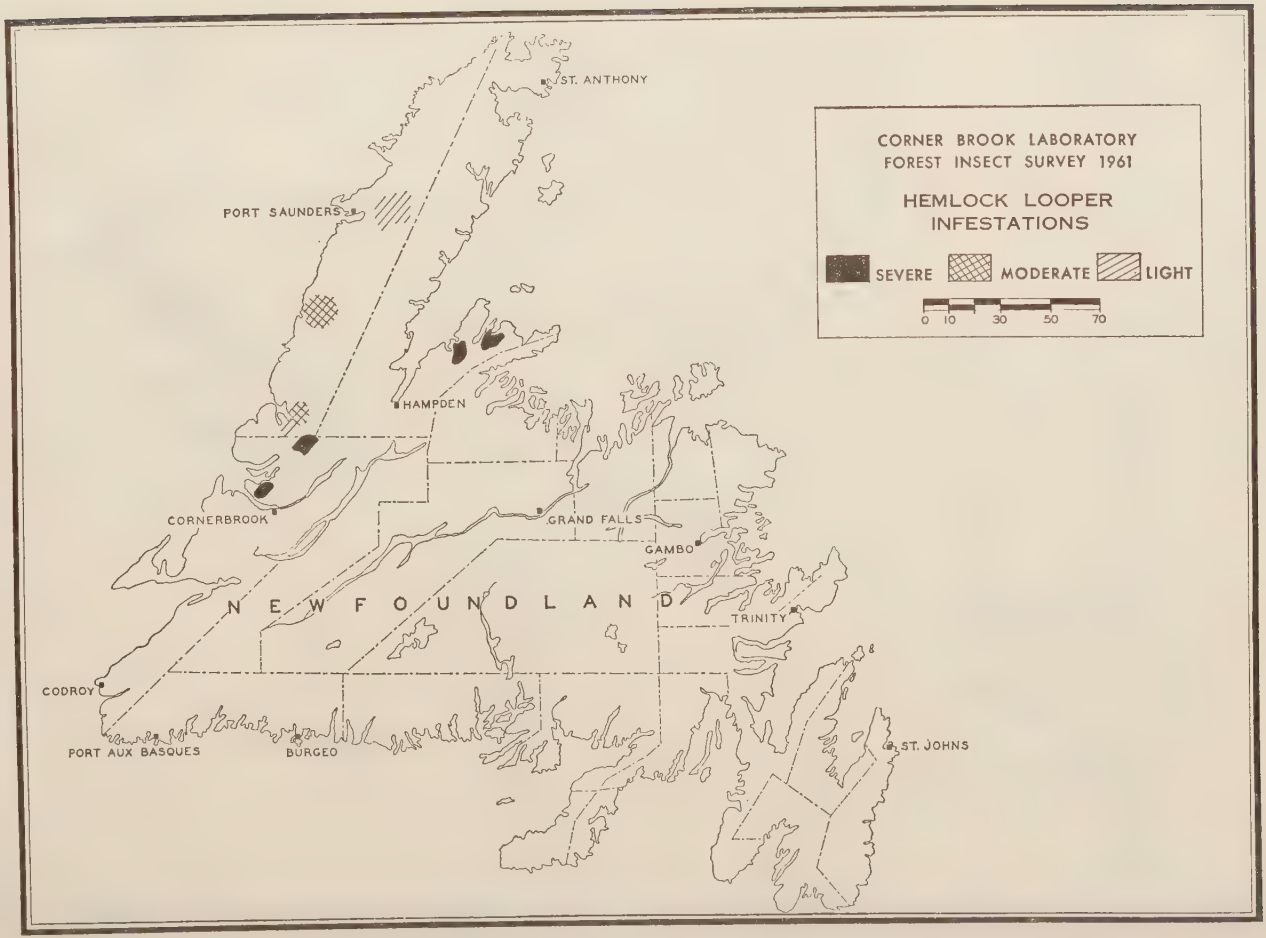
CORNER BROOK LABORATORY
FOREST INSECT SURVEY 1961
HEMLOCK LOOPER
INFESTATIONS
SEVERE
MODERATE
LIGHT
0 10 30 50 70
ST. ANTHONY
PORT SAUNDERS
HAMPDEN
CORNERBROOK
GRAND FALLS
GAMBO
NEWFOUNDLAND
TRINITY
CODROY
PORT AUX BASQUES
BURGEO
ST. JOHNS

PROVINCE OF NEWFOUNDLAND

FOREST DISEASE SURVEY

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INTRODUCTION

Prolonged severe weather during the winter of 1961 resulted in considerable winter drying, but there was only minor injury from wind and ice storms. June frosts were common in the central and eastern regions, and caused fairly extensive mortality of current foliage. Because of the unusually dry summer, especially in the eastern half of the Province, foliage diseases were suppressed.

Special survey projects included an investigation of birch leaf curl and the deterioration of balsam fir trees killed by the balsam woolly aphid. The principal objective of the latter project was to determine the extent and nature of the decay following tree mortality.

A total of 208 collections of diseased material was received during the year.

Winter Drying and Late Frost Damage—Winter drying was prevalent in central and western Newfoundland. Exposed trees along river banks and hillsides were most severly injured.

Damage by June frosts which resulted in the death of the current year's growth was reported from Badger, Birchy Basin, Goobies, and Pouch Cove.

Birch Curl—Scattered trees of both yellow and white birch showed some degree of leaf curl in various localities in the Province. The roots, stems, and leaves of affected trees were examined but no pathogens were detected. Grafting will be carried out early next season to test pathogenicity of this condition.

Needle Rust of Balsam Fir—Eastern Newfoundland experienced a very dry August and as a result the white spored needle rust on balsam fir was suppressed. However, this disease was prevalent on young balsam fir trees in western Newfoundland with reports indicating from 10 to 60 per cent of the current year's needles infected.

Needle Rusts of Spruce—*Chrysomyxa* spp. These rusts were again reported on white and black spruce trees from all parts of the Province. Infestations were lighter in the western district than had been previously recorded. In the Bonavista-Terra Nova area, reports indicate up to 40 per cent of the current year's needles infected.

Yellow Witches' Broom on Balsam Fir and White Spruce—Witches' brooms caused by *Melamsporella cerasti* (Pers.) Schroet. continue to be common. Severe infestations were noted at Frenchman's Cove, Badger, and Pouch Cove.

Armillaria Root Rot—This disease was recorded in several localities in western Newfoundland but remains at endemic levels. It has become less prevalent in the Upper Humber and Halls Bay regions.

Leaf and Twig Disease of Aspen—Tip blight of aspen, *Pollaccia radiosa* (Lib.) Bald. and Cif., was recorded from several locations in central and western Newfoundland. In most areas this disease appeared to be less prevalent than in past years.

Several collections of the ink spot disease, *Ciborinia bifrons* (Seav.) Seav., were received from the central region.

Diseases of Cherry—Black knot, shot hole, and leaf blister continued to be major factors affecting the vigour of both wild and domestic cherry in Newfoundland.

Diseases of Mountain Maple—Anthracnose, probably *Gloeosporium apocryptum* Ell. & Ev., and two tar spot diseases, *Rhytisma acerinum* Pers. ex Fr. and *R. punctatum* Pers. ex Fr., were observed to be widespread in the western half of the Province. In combination these diseases have caused extensive damage to the foliage of mountain maple.

Canker Disease on Chinese Elm—Several elms, *Ulmus parvifolia* Jacq., in Corner Brook were found to be severely attacked by cankers of *Nectria cinnabarina* Tode ex Fr. This disease has usually killed the trees thus seriously reducing their value as ornamentals.

MARITIME PROVINCES

FOREST INSECT SURVEY

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INTRODUCTION

A number of forest insect infestations continued in the Maritimes and their nature and extent varied widely within and between provinces. Spruce budworm attacks persisted in central New Brunswick and on Cape Breton Island, and occurred at isolated locations in Prince Edward Island. On the plateau of central Victoria County, Nova Scotia, infestations of the budworm and the eastern hemlock looper continued to cause deterioration and considerable mortality of balsam fir stands. The known northern limits of the balsam woolly aphid were extended in New Brunswick, but the intensity of the infestations in central New Brunswick declined because of low temperatures and inadequate snow cover in January and February, 1961. Old infestations of balsam fir sawfly subsided in Colchester and Cumberland counties, N.S., but the intensity of others, from Musquodoboit Harbour to Canso, increased. The larch sawfly was found in all counties of New Brunswick but defoliation was limited to a few scattered locations. In Nova Scotia, defoliation was less extensive than in 1960. The sawfly was collected in Prince Edward Island for the first time since 1939. Moderate to severe infestations of the pine leaf chermes occurred throughout New Brunswick and in western NovaScotia. Sawflies of the genus *Neodiprion* were more common than in past years. Severe skeletonizing of white birch and yellow birch foliage by the birch skeletonizer occurred in northwestern New Brunswick. Current beech scale attacks were generally light but trees on infested plots continued to deteriorate. The winter moth was found in new areas of Nova Scotia, but moderate to severe infestations were confined to western Nova Scotia where it was sometimes associated with the fall cankerworm, spring cankerworm, and an oak leaf roller. This leaf roller caused severe defoliation of red oak trees in some areas of west-central Nova Scotia.

The jack-pine sawfly was recorded in the Region for the first time. New records of parasitism were obtained for the European spruce sawfly, yellow spruce budworm, larch casebearer, white-pine weevil, satin moth, winter moth, fall cankerworm, ugly-nest caterpillar, and a leaf roller on maple.

In 1960 the Survey assumed direction of the operation of light traps at forest fire observation towers and field stations in New Brusnwick. These traps were operated daily in July and August and the numbers of common forest insects recorded. It is expected that this operation will add to our knowledge of species distribution and will become a useful survey tool.

In 1961 increased numbers of requests were received from forest industries for special surveys and observations on forest insect problems. Thanks are extended to all agencies and individuals for their co-operation.

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Of 3,846 insect collections received in the Region, 1,668 were from New Brunswick, 2,092 from Nova Scotia, and 86 from Prince Edward Island. Special reports totalled 454. The numbers of collections by major tree species were as follows:

Coniferous Trees	Collections		Broad-leaved Trees	Collections	
Balsam fir		611	Birch		
Spruce			White birch	130	
White spruce	678		Yellow birch	57	
Red spruce	215		Wire birch	42	
Black spruce	39		Miscellaneous birches	15	
Miscellaneous spruces	88	1020			244
Tamarack		422	Poplar		
Pine			Trembling aspen	141	
Eastern white pine	190		Silver poplar	26	
Jack pine	88		Carolina poplar	18	
Red pine	78		Balsam poplar	15	
Scots pine	9		Large tooth aspen	2	
Miscellaneous pines	8		Lombardy poplar	2	
		373	Miscellaneous poplars	22	
Eastern white cedar		49			226
Eastern hemlock		18	Maple		
Total		2,493	Red maple	71	
			Sugar maple	26	
Miscellaneous hosts or host unspecified	141		Silver maple	4	
			Miscellaneous maples	63	
					164
			Cherry	109	
			Apple	85	
			White elm	84	
			Alder	79	
			Red oak	67	
			Beech	51	
			Willow	50	
			Mountain ash	43	
			Ash	5	
			Linden	3	
			Hawthorn	2	
					578
			Total		1,212

GRAND TOTAL 3,846

IMPORTANT INSECTS

Spruce Budworm, *Choristoneura fumiferana* (Clem.)—Spruce budworm infestations in New Brunswick were largely confined again to the central part of the Province (see map). With minor exceptions defoliation in the north and in the south was negligible. Attacks of light to severe intensity occurred within a band about 70 miles wide extending roughly from Beechwood and Brockway on the west to Newcastle and Buctouche on the east. To the north, moderate to severe infestations occurred in small isolated areas west of the St. John River just south of Grand Falls, on the north side of the Tobique River near South Tilley, and again in the watersheds of the Tabusintac and Little South Tracadie rivers. To the south, small areas of moderate infestation were found between Cambridge and Springfield and near Kierstead Mountain.

Aerial spraying was carried out over 2,188,050 acres, mostly in Carleton, York and southern Northumberland counties, and in the Richibucto River and Salmon River areas of Kent County. This was successful in preserving much of the 1961 foliage, and many trees that were in serious condition in 1960 have improved.

Egg-mass counts on foliage collected at 1,020 locations in New Brunswick showed that areas of moderate to high numbers were considerably smaller than

in 1960 and in 1959. With a few exceptions these areas were located in the east-central part of the Province, in places unsprayed in 1961. Here egg population levels were lower than in 1960 but still high enough to indicate moderate to severe attacks in 1962; many balsam fir and red spruce trees have died and many are seriously weakened. In northern New Brunswick egg population levels increased about one and one-half fold from 1960, but were still very low. In the southern counties of the Province about one-half as many eggs were found as in 1960 and population levels were very low.

In Nova Scotia spruce budworm attacks were very light except on Cape Breton Island, where severe infestations occurred along parts of the east coast and on the central plateau of Victoria County. Along the coast between Warren Brook and Ingonish Beach defoliation of the new shoots of dominant and co-dominant white spruce ranged from 30 to 90 per cent and averaged 70 per cent. Attacks of corresponding severity occurred on occasional red spruce trees between Warren Brook and North Ingonish. Many of these trees are overmature and dead and dying branches are common. Balsam fir trees growing under budworm-attacked spruce lost 80 per cent of their new needles, and as the former have been persistently attacked by the balsam woolly aphid, they are severely weakened. Open-growing fir trees were only lightly attacked. At the Cape Breton Highland Park Headquarters several severely defoliated overmature white spruce trees were infested with the eastern spruce beetle.

Aerial surveys and limited ground observations showed a continuation of infestations on balsam fir by the spruce budworm and eastern hemlock looper on the plateau of central Victoria County. Damaged balsam fir stands were found in a band about 7 miles wide from Cape Smoky to the headwaters of First Fork Brook on the Northeast Margaree River and included coastal areas south to Briton Cove. Within this band conditions varied somewhat, but the oldest damage, caused mostly by the spruce budworm, was in the northeast, and the more recent damage, attributed mainly to the hemlock looper, was in the southwest. In the northeast almost all older trees were dead; some were killed by budworm in 1957, and some were killed more recently by both the budworm and the looper, probably beginning in 1959. In the central area, east and west of Barachois Brook, almost all tree mortality seems to have occurred in 1960 and in 1961. Here most damaged stands contained a centre of dead trees, and a periphery of trees severely defoliated in 1961; many of the latter will probably die in 1962. Both the budworm and the looper have been present in these stands but the pattern of damage suggested that the looper was largely responsible for the mortality. In the southwest small patches of dead trees were observed, presumably killed in 1960 by the hemlock looper; the looper caused severe defoliation in 1961. On the extreme southwestern edge of this area along the Middle Branch North River, the tips of the crowns of dominant trees were severely attacked by the looper but on other trees the loss of old and new foliage was light.

Because of the relative inaccessibility of this area, little information is available on the degree and extent of balsam woolly aphid infestations; twig attacks have occurred but they are believed to be largely confined to valley bottoms and slopes.

No spruce budworm egg masses were found at 19 locations in western Nova Scotia. In eastern Nova Scotia samples were taken at 55 locations of which only 12 were positive. On the basis of these, moderate to severe defoliation can be expected in 1962 at Clyburn Brook, Warren Lake, Ingonish Centre, and Wreck Cove, Victoria County.

In Prince Edward Island spruce budworm numbers were generally low. At Bedford and Orwell, Queens County, and at Poole's Corner, Kings County,

a few white spruce trees lost up to 50 per cent of their new needles. Of 34 egg-mass samples taken only 10 were positive. This indicated that budworm population levels would be low in 1962 except at Poole's Corner, where a moderate infestation on white spruce trees can be expected.

	Reports	Collections	Larvae per tree sample	
			Av.	Dev. from 1960
New Brunswick	25	220	6.1	−1.1
Nova Scotia	14	99	5.3	+3.5
Prince Edward Island	4	7	1.7	—

Balsam Woolly Aphid, *Adelges piceae* (Ratz.)—The balsam woolly aphid is known to occur throughout Nova Scotia and Prince Edward Island. The accompanying map shows that it has been found throughout southern New Brunswick and in eastern coastal areas.

The discovery of light to severe stem attacks in 1961 near Little Clearwater, Carleton County and along the O'dell River, Victoria County, and of twig attacks near Warwick Settlement, Northumberland County, extended the known northern limits of the insect in New Brunswick. The first two of these infestations were about 40 and 60 miles north, respectively, of the nearest previously known area of attack near Millville, but the last represented only a slight northerly extension. All of these infestations were localized, and have been present for five or more years.

The intensity of twig attacks in New Brunswick has been markedly reduced in the past few years, due mainly to low winter temperatures. Low temperatures occurred and snow cover was light in January and February, 1961, in the central part of the Province. R. C. Clark reported that this caused further reduction in the intensity of twig attacks and striking reductions in the intensity of stem attacks above the snow line (above 18 inches from the ground) in some areas. Many balsam fir trees in the Maritimes have been severely weakened and some have died as a result of previous attack, especially in coastal areas and at locations where infestations of the spruce budworm and other defoliating insects have been severe.

Extensive field observations and the analysis by D. O. Greenbank of 158 bark samples from 93 locations indicated that moderate and severe stem attacks are present in the following areas:

New Brunswick—Village St. Laurent, Six Roads, Scotch Lake, Debec, Chipman, Coal Creek, Keswick, Ridge, Harvey Station, Skiff Lake, Taymouth, Canterbury, Lower Pokiok, McAdam, Cranberry Lake, Eel Brook Lake, and Seal Cove.

Nova Scotia –Sheet Harbour, Middle Stewiacke, Big Mark Corner, between Aspen and Cameron Settlement, Beech Hill, and Nuttby.

No foreign predators were introduced into New Brunswick in 1961. Both native and introduced predators were hard to find in most areas, but it could not be determined if this resulted from the reduced balsam woolly aphid numbers or some other cause.

	Reports	Collections
New Brunswick	2	49
Nova Scotia	13	86
Prince Edward Island	1	5

Eastern Hemlock Looper, *Lambdina fiscellaria fiscellaria* (Guen.)—Combined infestations of this species and the spruce budworm occurred in balsam fir stands on the plateau of central Victoria County and are discussed under "spruce budworm". In other parts of Nova Scotia the hemlock looper caused light defoliation of balsam fir trees along the Whippey Lake and Farm

Lake roads near New Annan, Colchester County. Elsewhere population levels were low.

	Reports	Collections	Larvae per tree sample	
			Av.	Dev. from 1960
New Brunswick	0	10	0.4	−0.2
Nova Scotia	7	151	1.7	+0.8

Balsam-fir Sawfly, *Neodiprion abietis* complex—Infestations reported since 1959 between Glenholme, Colchester County, and Westchester Station, Cumberland County, N.S., subsided, largely due to the effect of a virus disease. Elsewhere in Colchester County a few small red spruce trees near Frog Lake lost most of their old foliage, and similar trees at Lower Onslow were lightly attacked. Light attacks occurred on old foliage of balsam fir near Whippey Lake.

Sawfly numbers were higher than in 1960 in coastal areas from Musquodoboit Harbour to Canso. Within this general area infestations were severe between Lake Charlotte and Ship Harbour where most of the old foliage was destroyed on dominant balsam fir and on black spruce and red spruce trees. From Watt Section to Halfway Brook the loss of old balsam fir needles averaged about 60 per cent and effects were accentuated by severe twig attacks by the balsam woolly aphid.

In Inverness County light attacks on old foliage of balsam fir occurred near Blue Mills for the second consecutive year, and between Frizzleton and Forest Glen.

Populations were low and no damage was reported in New Brunswick and Prince Edward Island.

The incidence of virus disease was high in specimens from all areas of severe infestation. Parasites reared, in addition to those listed in the 1960 Report, were *Lamachus* sp. near *ruficoxalis* (Cush.), *Lamachus* sp., *Exenterus canadensis* Prov., *Drino bohemica* Mesn., and *Diplostichus hamatus* (A. & W.).

	Reports	Collections
New Brunswick	1	19
Nova Scotia	13	114

Balsam Shoot-boring Sawfly, *Pleroneura borealis* Felt—Light damage to balsam fir was observed at scattered locations in Restigouche and Northumberland counties, N.B., and at Italy Cross, Lunenburg County, Pleasant River, Queens County, Sheet Harbour, Halifax County, and Upper Stewiacke, Colchester County, N.S.

	Reports	Collections
New Brunswick	2	6
Nova Scotia	2	4

European Spruce Sawfly, *Diprion hercyniae* (Htg.)—Population levels were low. The data below indicate that numbers decreased slightly from 1960, and that disease and parasites (introduced) are still active.

Province	Generation	Number of larvae collected (instars 4, 5, 6)		Average munber of larvae per tree sample		Per cent diseased		Per cent parasitism	
		1960	1961	1960	1961	1960	1961	1960	1961
New Brunswick	1	233	288	1.1	1.5	0.4	8.9	4.2	6.8
	2	672	336	3.2	2.3	6.9	5.4	5.5	8.1
Nova Scotia	1	508	340	1.9	1.1	6.6	0	7.9	11.8
	2	544	37*	2.7	0.7	13.4	7.4	15.4	11.1

*Due in part to preponderance of early sampling.

Extensive sampling on Grand Manan Island, N.B., showed that sawfly numbers were about the same as on the mainland. However, no evidence of disease was found, and about 31 per cent of the larvae collected were parasitized by *Drino bohemica* Mesn., which was introduced only on the mainland. *Exenterus vellicatus* Cush., another parasite introduced only on the mainland, was not found.

	Reports	Collections
New Brunswick	7	112
Nova Scotia	122	202
Prince Edward Island	0	3

Yellow-headed Spruce Sawfly, *Pikonema alaskensis* (Roh.)—Isolated infestations of moderate and severe intensity occurred at the following locations in Nova Scotia:

Location	Host	Infestation class
Denver, Guysborough Co.	Red spruce	Severe
Lochaber, Guysborough Co.	Red spruce	Severe
Pope's Harbour, Halifax Co.	Black spruce	Severe
Mushaboom, Halifax Co.	Black spruce	Severe
Springhill, Cumberland Co.	Red spruce and white spruce	Severe
Baddeck, Victoria Co.	Red spruce	Moderate
Shortt's Lake, Colchester Co.	Red spruce	Moderate
Nuttby, Colchester Co.	Red spruce	Moderate
Enfield, Hants Co.	White spruce and red spruce	Moderate

Elsewhere in the Maritimes no defoliation of any importance was observed.

	Reports	Collections
New Brunswick	1	38
Nova Scotia	6	90

Spruce Bud Midge, *Rhabdophaga swainei* Felt—Dead buds on small red spruce and white spruce trees, resulting from attacks in 1960, were common in northeastern New Brunswick. They were observed less often in other parts of the Province. Elsewhere they were found only at Bonshaw, P.E.I. Counts of dead buds at several locations showed that numbers ranged from 20 to 300 per 100 square feet of foliage surface. Numbers per sample unit were highest at Tracadie, Union Brook, Campbellton, and Bonshaw; where they were 300, 221, 155, and 183 respectively.

The following chalcid parasites were reared from this host in the Maritimes: *Amblymerus* sp., *Torymus* sp., and *Platygaster* sp.

	Reports	Collections
New Brunswick	4	21
Prince Edward Island	1	2

Yellow Spruce Budworm, *Zeiraphera fortunana* Kft. and ***Spruce Bud Moth,*** *Zeiraphera ratzeburgiana* Ratz.—These species are often found together on the new shoots of open-growing white spruce trees causing damage similar to that of the spruce budworm. They have been common throughout the Maritimes for many years but they have not been known to cause more than light loss of new foliage. In 1961, as in 1960, they were least common in western Nova Scotia. In other districts sizeable but not high numbers were found at sampling

stations at Strathlorne and Grand Anse River on Cape Breton Island, and at Shale Hill, Albert County, Gilbert's Corner, Westmorland County, at Glassville and Kirkland, Carleton County, and near North Head, Grand Manan Island, N.B. In Nova Scotia the yellow spruce budworm was the more common species but in New Brunswick the spruce bud moth predominated. Defoliation of new shoots, attributable to these species, was no more than light at any location.

The ichneumonid parasite, *Triclistus podagricus* (Grav.), was reared from the yellow spruce budworm for the first time in the Maritime Provinces.

	Reports	Collections
New Brunswick	13	60
Nova Scotia	3	56
Prince Edward Island	6	2

Larch Casebearer, *Coleophora laricella* (Hbn.)—Casebearer population levels remained generally low throughout the Maritime Provinces. Data from the sequential sampling of overwintering larvae at sampling stations follow:

District	Number of sampling stations	Average number of cases per sample	Deviation from 1960	Infestation class
Southern New Brunswick	18	1.8	+1.3	Light
Northeastern New Brunswick	13	3.0	+2.2	Light
Northwestern New Brunswick	15	2.0	+1.0	Light
Eastern Nova Scotia	16	4.7	+0.9	Light
Western Nova Scotia	16	1.1	−3.0	Light
Prince Edward Island	3	3.2	+1.1	Light

Light defoliation of tamarack trees was observed at Tracadie, Gloucester County, St. Jacques, Madawaska County, and Holmesville, Carleton County, N.B., and at River Philip, Cumberland County, N.S. Elsewhere no more than traces of defoliation were observed.

Tabulated below are the percentages of parasitism by the introduced species *Epilampsis laricinellae* (Ratz.) and *Agathis pumila* (Ratz.) since 1958. These were obtained by rearing and dissecting 5,154 overwintering casebearers in New Brunswick and 11,045 in Nova Scotia.

Year	Casebearer infestation class		Agathis pumila		Epilampsis laricinellae		Total parasitism	
	N.B.	N.S.	N.B.	N.S.	N.B.	N.S.	N.B.	N.S.
1958	Light to moderate	Moderate	25.4	0.7	5.7	4.1	31.1	4.8
1959	Light	Moderate	13.3	0.1	2.7	11.4	16.0	11.5
1960	Light	Light	5.7	5.0	2.0	14.1	7.7	19.1
1961	Light	Light	1.8	1.9	0.5	5.4	2.3	7.3

A. pumila was recovered in St. John County, N.B. for the first time in 1961.

	Reports	Collections
New Brunswick	4	50
Nova Scotia	6	41
Prince Edward Island	1	4

Larch Sawfly, *Pristiphora erichsonii* (Htg.)—Sawfly larvae and evidence of defoliation were found in all counties of New Brunswick, but numbers of the insect were generally low and noticeable loss of foliage was confined to a few trees at widely scattered locations (see map). Defoliation was severe on isolated tamarack trees at Springfield, Kings County, 10 miles north of St. Martins, St. John County, and on the woodlot of the University of New Brunswick at Fredericton. Foliage loss was moderate on one or two trees along the Dock Brook Road, Grand Manan Island, and 4 miles east of McAdam. Restricted light defoliation occurred in Restigouche, Madawaska, Carleton, Sunbury, Kings, and Charlotte counties.

In Nova Scotia, defoliation was less extensive than in 1960 particularly on Cape Breton Island, in Guysborough County, and along the South Shore. Severe defoliation occurred on small numbers of trees and on reproduction at Goff's Corner and near Kelly Lake airport, Halifax County, near Economy, Colchester County, and between North Range and Weymouth, Digby County. Moderate sporadic defoliation was observed in coastal areas of Halifax County between Halfway Brook and Quoddy, and from Oyster Pond to Lake Charlotte, on a few trees at Sydney Mines, and at Hassett, Digby County. Light defoliation was seen throughout most of the remainder of Halifax and Digby counties, in the northwestern areas of Yarmouth County, and in coastal parts of Guysborough County as far east as Sherbrooke.

Analyses of cocoons collected at Hassett from one-square-foot trays, one under each of 10 trees, showed that 75 and 78 per cent were chewed by small mammals in 1960 and in 1961.

The percentages of successful parasitism in Nova Scotia by the introduced species, *Mesoleius tenthredinis* Morley, in 1959 and 1960 were 14.2 and 26.6 respectively. These were calculated by J. A. Muldrew and were based on records of total emergence.

In Prince Edward Island a colony of larch sawfly larvae was collected near Miscouche and light defoliation was observed on two tamarack trees at Wellington, Prince County. These are the first Survey records of the insect in the Province since 1939.

	Reports	Collections
New Brunswick	9	45
Nova Scotia	10	124
Prince Edward Island	1	1

Pine Leaf Chermes, *Pineus pinifoliae* (Fitch)—In 1961, as in past odd-numbered years, red spruce trees throughout the Region were infested with galls, and the migrants from these were later found on white pine needles. Moderate to severe infestations occurred throughout New Brunswick and in western Nova Scotia. Numbers of the insect were especially high in some areas of southern New Brunswick and in parts of Digby, Queens, and Lunenburg counties of Nova Scotia. As a result of these attacks considerable shoot mortality on white pine is expected in 1962.

	Reports	Collections
New Brunswick	28	67
Nova Scotia	3	44
Prince Edward Island	1	0

Pine Sawflies, *Neodiprion* spp.—Several species of these sawflies, usually scarce in the Maritime Provinces, were more common in 1961.

Colonies of the red-pine sawfly, *Neodiprion nanulus nanulus* Schedl, could be found in most places where red pine occurs in New Brunswick, but damage was negligible. An infestation in a red pine plantation at Acadia Forest Experiment Station, sprayed in 1960, showed no resurgence. Collections were also

taken from jack pine at Coles Island, Queens County, and Pollet River, Westmorland County. A few colonies were collected in Lunenburg and Pictou counties in Nova Scotia. A few trees at Haliburton, Pictou County, were severely defoliated, but the stand in general was lightly infested for the second year.

Several small colonies of the jack-pine sawfly, *Neodiprion pratti paradoxicus* Ross, were found at four localities near the south end of Grand Lake, Queens County, N.B., on both sides of the St. John River. Colonies were also collected at Alma, Pictou County, and Middle Stewiacke, Colchester County, N.S. A few larvae were collected at Tracadie Range, Northumberland County, N.B. in 1959. These are the first collections of this species in the Maritime Provinces.

The white-pine sawfly, *Neodiprion pinetum* (Nort.), was collected at Stewarts Hill, Halifax County, and Mount Thom, Pictou County, N.S., and at O'Leary, Prince County, P.E.I. It is usual to get about one collection of this insect every two or three years in the Maritimes.

Larvae of *Neodiprion virginianus* complex were collected in New Brunswick in 1949 at Doyle Hill and Collier Mountain, Albert County, and in 1952 at Acadia Forest Experiment Station. In 1961, larvae were collected at Lakeburn, Westmorland County, at Acadia Forest Experiment Station, N.B., and at Kenzieville and Blue Mountain, Pictou County, N.S. All collections were taken from jack pine except for one each on Scots pine and red pine at Blue Mountain, and one on lodgepole pine at Acadia Forest Experiment Station; the last may be a new host record. Noticeable defoliation occurred only at Blue Mountain where 22 ornamental Scots and jack pines lost much of their old and new foliage.

	Reports	Collections
New Brunswick	10	47
Nova Scotia	11	23
Prince Edward Island	1	1

White-pine Weevil, *Pissodes strobi* (Peck)—Groups of open-growing white pine trees up to about seven feet high were examined at various locations in New Brunswick and Nova Scotia to determine incidence of attack. The results are tabulated below:

Location	Number of trees examined	Number of trees attacked	Number of trees with current attacks
NEW BRUNSWICK			
Glazier Lake	51	28	12
Tabusintac River	50	31	12
Upper Blackville	50	40	15
New Jersey	50	45	31
Perth	50	8	2
Covered Bridge	50	39	12
Hanwell Road	50	6	4
Robertson Point	49	8	6
Elgin	50	13	10
NOVA SCOTIA			
Ingonish	56	22	22
Glenelg	52	18	18
Fifteen Mile Stream	75	23	23
Pinehurst	56	29	11
Milton	50	8	3

An undescribed ichneumonid parasite, *Pediobius* sp., was reared in New Brunswick from shoots infested with the white pine weevil.

	Reports	Collections
New Brunswick	3	16
Nova Scotia	3	14
Prince Edward Island	0	1

European Pine Shoot Moth, *Rhyacionia buoliana* (Schiff.)—Red pine trees up to 15 feet high were severely attacked near Blue Mountain fire tower, Pictou County, N.S. Light attacks occurred in a nearby nursery on both red pine and Scots pine trees, and on the same hosts at Garden of Eden Barrens. In New Brunswick moderate attacks occurred on occasional ornamental red pines at Moncton. About two per cent of the new terminal shoots of red pine trees were infested at Mile 10 on the Drummond Road in Camp Gagetown, in areas surrounding Rooth Station and Tracy, and in a plantation at the Acadia Forest Experiment Station.

	Reports	Collections
New Brunswick	4	3
Nova Scotia	2	5

Birch Casebearer, *Coleophora fuscedinella* (Zell.)—Infestations occurred in many parts of the Region, varying greatly in intensity both within and between areas. Attacks were more severe than in 1960 in parts of northern New Brunswick and in Victoria and Inverness counties of Nova Scotia. White birch was the principal host with yellow birch and wire birch less severely attacked. Moderate to severe infestations were observed in the following areas.:

New Brunswick—Dalhousie to west of Tidehead, Charlo Station, New Mills, Black Point, Belledune, Upper Blackville, Cains River Road, Boiestown, Plaster Rock-Renous Road (Mile 9 to west of McGraw Brook), Wapske to Odell River, and from Bristol to Florenceville.

Nova Scotia—Grand Anse River Valley, Cape North to Neil Harbour and Aspy Bay, Ingonish South to MacLeod Brook, New Campbellton, and Joggins.

Prince Edward Island—Charlottetown and Alberton.

	Reports	Collections
New Brunswick	9	35
Nova Scotia	4	29
Prince Edward Island	2	0

Birch Leaf Miner, *Fenusa pusilla* (Lep.) and ***Birch Leaf-mining Sawfly,*** *Heterarthrus nemoratus* (Fall.)—The birch leaf miner caused browning of the foliage of wire birch trees and less often white birch in all parts of New Brunswick except Gloucester and Restigouche counties. Infestations were moderate but occasional trees were severely attacked at Glazier Lake, Madawaska County, Coldstream, Carleton County, at a number of locations in central York County, along the Southwest Miramichi River, in areas south and east of Chatham, and in parts of Queens, Kings, Charlotte, and St. John counties. Infestations were generally severe in the Moncton area.

In Prince Edward Island moderate browning of foliage by the miner was observed in small groups of wire birch trees near Murray River and at Mount Stewart.

Infestations of varying intensity occurred throughout Nova Scotia. Moderate to severe browning was observed throughout much of the Annapolis Valley, at Meisners, Hubbards, East River and Italy Cross, Lunenburg County, at Brooklyn, Queens County, from Tatamagouche to Brulé and Masstown, Colchester County, near Westville and New Glasgow, Pictou County, and at Grand Anse River, Inverness County.

Prior to 1960 the birch leaf-mining sawfly was common in Nova Scotia, but for the second consecutive year no collections of the insect were taken.

	Reports	Collections
New Brunswick	8	16
Nova Scotia	4	35
Prince Edward Island	3	2

Birch Skeletonizer, *Bucculatrix canadensisella* Cham.—In New Brunswick severe skeletonizing of the foliage of white birch and less frequently yellow birch trees occurred along the St. John River in Victoria and Madawaska counties as far north as Edmundston, at Jardine Brook, at Kedgwick River, along the Little Tobique Road, and near Nictau Lake. A moderate infestation was observed on a few white birch trees near Coles Island. Attacks of lesser severity occurred on white birch at a few scattered locations in York and Carleton counties.

In Nova Scotia light to moderate infestations of the skeletonizer together with earlier attacks of the birch leaf miner resulted in severe loss of foliage of white birch trees of all sizes at Grand Anse River, Inverness County; yellow birch reproduction was only lightly attacked. Skeletonizing was moderate on white birch at Salem, Cumberland County. Attacks were light on the same host at Brookdale, Cumberland County, and on white and yellow birch at Melrose, Guysborough County.

In Prince Edward Island no collections of the insect were taken nor were any infestations observed.

	Reports	Collections
New Brunswick	2	3
Nova Scotia	3	5

Satin Moth, *Stilpnotia salicis* (L.)—Moderate to severe defoliation of Carolina poplar, silver poplar, and to a lesser extent trembling aspen and willow, was observed at the following locations:

New Brunswick—Charlo, Pointe Verte, Petite Rocher, Turgeon, Shippegan, Rogersville, Sunny Corner, Jacksonville, Kingsclear, Fredericton, Sussex Corners, Hampton Station, and Saint John.

Nova Scotia—North East Margaree, Bucklaw, Barra Head, Belle Coté, Wallace Station, Wallace Bridge, South Pugwash, Northport, Amherst, and River Hebert.

Prince Edward Island—Rollo Bay, St. Peters, Wood Island, Crapaud, Searletown, and Port Hill.

Attacks of light intensity were observed at locations in northeastern New Brunswick and in eastern Nova Scotia, mainly on Cape Breton Island.

Two braconid parasites, *Apanteles melanoscelus* (Ratz.) and *Microgaster canadensis* Mues., were reared from the satin moth for the first time by the Survey in this Region.

	Reports	Collections
New Brunswick	11	14
Nova Scotia	4	23
Prince Edward Island	2	3

Forest Tent Caterpillar, *Malacosoma disstria* Hbn.—Population levels were very low throughout the Region. Small numbers of egg masses were collected for the first time in several years in New Brunswick. The occurrence of these, and small but increased numbers of larval collections from scattered locations, indicate that the insect is becoming more common. Numbers of moths

captured at light traps may also prove useful in forecasting the build-up of populations in time and place. The locations of New Brunswick traps are listed from north to south with total catches for 1960 and 1961:

Location	Number of moths captured	
	1960	1961
Wild Goose, Restigouche Co.	0	0
Squaw Cap, Restigouche Co.	3	9
Kedgwick, Restigouche Co.	0	0
Atkinson, Restigouche Co.	1	0
Middle Brook, Restigouche Co.	0	0
McCormack, Restigouche Co.	0	1
Green River, Madawaska Co.	0	4
Summit Depot, Madawaska Co.	0	5
Quisibis, Madawaska Co.	1	5
Allardville, Gloucester Co.	5	2
Nine Mile Brook, Gloucester Co.	1	6
Clark Mtn., Victoria Co.	1	42
Moose Mtn., Carleton Co.	49	41
Ashton Hill, Northumberland Co.	371	120*
Doaktown, Northumberland Co.	5	6
Narrows, York Co.	0	1
Mt. Hope, York Co.	5	7
Fredericton, York Co.	37	39
Harvey Mtn., York Co.	3	33
Tower Hill, Charlotte Co.	6	0
Keenan Hill, Westmorland Co.	21	1
Fundy National Park, Albert Co.	2	1

* Conservative estimate—material in poor condition.

	Reports	Collections
New Brunswick	3	4
Nova Scotia	2	5
Prince Edward Island	1	1

Beech Scale, *Cryptococcus fagi* (Baer.)—Beech trees on plots maintained in Nova Scotia and southern New Brunswick continued to deteriorate. At Bayview, Digby County, in Nova Scotia the proportions of uninfested trees were further reduced from 14 to 9 per cent, and at Indian Garden Road, Queens County, from 41 to 38 per cent. Cankered trees with light scale infestations were prevalent in all plots, but the proportions of dead and dying trees generally increased.

Severe scale attacks were found at Clair, Madawaska County, near the northern limit of beech in eastern Canada, and at Dark Harbour, Grand Manan Island, N.B. A moderate attack was noted at Montague, P.E.I.

	Reports	Collections
New Brunswick	10	26
Nova Scotia	6	0
Prince Edward Island	5	4

Winter Moth, *Operophtera brumata* (L.)—Each year the winter moth has been collected in new areas of Nova Scotia. The present distribution of infestations and its apparent pattern of spread leave little doubt that the species will eventually be found in Prince Edward Island, southern New Brunswick and Maine.

In 1961 small numbers of larvae were found for the first time on Cape Breton Island at Inverness and Margaree Forks, and on the mainland at Nappan, Cumberland County, and Milford Haven Bridge, Guysborough County.

Moderate to severe defoliation was general in western Halifax, southern Lunenburg, eastern Queens, eastern Kings, and western Hants counties, and occurred at New Ross, Waterville, Middleton, and Economy. The chief hosts were unsprayed apple trees, red oak, and white elm trees. In some areas the fall cankerworm, spring cankerworm, and an oak leaf roller were found in association with the winter moth.

The European parasites, *Agrypon flaveolatum* (Grav.) and *Cyzenis albicans* (Fall.), were released in orchards adjacent to hardwood stands near Kentville. In addition liberations of three species, *Phobocampe crassiuscula* (Grav.), *Lypha dubia* (Fall.), and *Phorocera obscura* Fall., were made at Oak Hill, near Bridgewater.

A. flaveolatum and *C. albicans* have previously been recovered only at Oak Hill. They were reared for the first time from host material collected in 1960 at other locations as follows:

A. flaveolatum—*Wentzell Lake, Lunenburg County; *Great Hill, Queens County.

C. albicans—Debert Beach road, Colchester County; *St. Croix, Hants County; Chester Basin, Cookville, *Moose Lake, *Wentzell Lake, Lunenburg County; Mill Village road, Mill Village, Great Hill, Queens County.

The closest liberation point of *C. albicans* to Debert Beach road was St. Croix, about 40 miles away, where it was released in 1958.

One larva collected at Hebron, Yarmouth County, was infected with a polyhedral virus disease. This is the first field record of a polyhedrosis in this insect.

	Reports	Collections
Nova Scotia	9	156

Fall Cankerworm, *Alsophila pometaria* (Harr.)—Defoliation of white elms was moderate near McGowan's Corner and light at scattered locations in other parts of New Brunswick.

A few cankerworms were collected from beech trees in the city park at Charlottetown, P.E.I., but defoliation was negligible.

In Nova Scotia light defoliation occurred on apple trees at Tupperville; on white elm trees at Bridgetown, River Hebert; in the North East Margaree Valley; and on red maple trees at Lake Jolly.

Data on the association of fall cankerworm with winter moth at locations in Nova Scotia are listed below:

Location	Ratio fall cankerworm to winter moth	Hosts attacked	Degree of defoliation
Annapolis County			
Paradise	1:1	white elm	light
Squirreltown	1:2	red maple	light
Antigonish County			
Antigonish	3:2	white elm, apple	light
Colchester County			
Upper Stewiacke	1:1	white elm	light
Guysborough County			
Milford Haven Bridge	2:1	apple	light
Halifax County			
Northeast of Bedford	3:1	red oak, red maple, trembling aspen	severe
Gays River	1:3	white elm	light
Timberlea	1:200	red oak	severe
Kings County			
Grand Pré	1:16	apple	severe
Lunenburg County			
Cookville	1:10	red oak	moderate
West Northfield	1:24	red oak	moderate
Queens County			
Mill Village	1:49	red oak	moderate
North Brookfield	1:13	basswood, red oak	severe
Moosehorn Lake	1:16	red oak, red maple	severe
Middledale	1:49	red oak	moderate

* Liberation points.

A chalcidoid parasite, reared in large numbers from fall cankerworm eggs collected at McGowan's Corner in 1960, was identified as a species of *Telenomus*. An ichneumonid parasite, *Itoplectis quadricingulatus* (Prov.), was reared in 1961; this is believed to be the first record from this host in the Maritimes.

	Reports	Collections
New Brunswick	8	14
Nova Scotia	4	46
Prince Edward Island	2	1

Spring Cankerworm, *Paleacrita vernata* (Peck)—The spring cankerworm and the winter moth caused severe defoliation to white elm trees at and near Windsor, at St. Croix and at Brooklyn, Hants County, N.S. Proportions of the former to the latter were: 9:1, 3:2, and 4:1. An unsprayed apple orchard at Middleton was moderately defoliated by the spring cankerworm, winter moth, and fall cankerworm occurring in the proportion of 30:2:1.

	Reports	Collections
Nova Scotia	3	16

An Oak Leaf Roller, poss. *Pseudexentera cressoniana* Clem.—Larvae were again common in most red oak stands in Lunenburg and Queens counties, N.S. The amount of defoliation caused by this species was difficult to assess because of its frequent association with the winter moth and the fall cankerworm. However, severe defoliation, attributed mainly to the leaf roller, was observed at Maitland Bridge, Annapolis County, and at Meisners and near Forties Settlement, Lunenburg County.

	Reports	Collections
Nova Scotia	2	27

Spiny Elm Caterpillar, *Nymphalis antiopa* L.—Colonies of larvae were common but not numerous. Light defoliation of white elm trees, usually near the tops, was observed at Fredericton, N.B., and at Upper Stewiacke, Colchester County, and at North East Margaree and Frizzleton, Inverness County, N.S. The insect was also collected from trembling aspen and willow at scattered locations but defoliation was negligible.

	Reports	Collections
New Brunswick	1	3
Nova Scotia	3	24

Ugly-nest Caterpillar, *Archips cerasivoranus* (Fitch)—Infestations continued on roadside cherry bushes throughout most of the Maritime Provinces. General observations, and nest counts from 30 areas, each of 1,000 square feet, showed that infestations were most severe in parts of Carleton, Northumberland, Sunbury, Kings, and Queens counties, N.B., and at locations in Pictou, Cumberland and Hants counties, N.S. Nests were less common on Prince Edwatd Island than on the mainland.

Most egg masses reared in New Brunswick produced at least a few specimens of the chalcidoid parasite, *Trichogrammatomyia tortricis* Grlt. This is the first Survey record from this host in the Maritimes.

	Reports	Collections
New Brunswick	34	35
Nova Scotia	7	25
Prince Edward Island	3	3

Fall Webworm, *Hyphantria cunea* (Drury)—The fall webworm was not found in northeastern New Brunswick but it was common throughout the remainder of the Maritimes. Some counts of nests along roadsides are listed below:

Location	Number of nests per mile	
	1960	1961
NEW BRUNSWICK		
Westmorland County		
Port Elgin—Cape Bald	—	6
Cape Bald—Shediac	—	10
	—	10
PRINCE EDWARD ISLAND		
Kings County		
New Annan—Burlington	—	2
Burlington—Dingwell Mills	—	2
Montague area	—	1
NOVA SCOTIA		
Inverness County		
MacKenzie Mtn.	—	24
Margaree Harbour Bridge—Margaree Forks	—	6
Margaree Forks—N.E. Margaree	—	3
Antigonish County		
Havre Boucher Bridge—Monastery	14	19
Monastery—Afton	38	12
Antigonish—South Lochaber	7	4
Pictou County		
Tony River—River John	11	5
Colchester County		
River John—Brulé	60	38
Tatamagouche—Brulé	37	8
Hants County		
Admiral Rock—Maloney Rd.	28	18
Rawdon Gold Mines	—	75
Windsor Rd.	—	8
Annapolis County		
Inglisville Rd.	220	543

	Reports	Collections
New Brunswick	2	6
Nova Scotia	3	99
Prince Edward Island	2	0

A Leaf Roller on Maple, *Sparganothis pettitana* (Rob.)—This insect continued to cause varying degrees of defoliation of red maple trees in central New Brunswick where it has been found since 1956. Severe defoliation occurred between Jemseg and the Narrows and in the Cumberland Bay area. Moderate defoliation was observed between Minto and Chipman, on the Bantalor road, at Ludlow, on the Cains River road, on Route 33 near Route 36, near Little Forks on Route 34, and near Fredericton. Light defoliation occurred near Rogersville. The insect was found over wider areas in New Brunswick than in previous years. and it was collected for the first time on Prince Edward Island.

Parasites reared to date are: species of *Apanteles, Microgaster peroneae* Walley, *Dimmockia pallipes* Mues., *Elasmus atratus* How., *Scambus nucum* (Ratz.), *Mesochorus* sp., and *Winthemia* sp.

	Reports	Collections
New Brunswick	17	35
Prince Edward Island	1	2

Striped Alder Sawfly, *Hemichroa crocea* (Fourc.)—The infestations reported in Pictou County, N.S. since 1959 subsided. Earlier attacks of the alder flea beetle, which destroyed much of the alder foliage, probably contributed to the collapse of the outbreak.

A colony of larvae from Lorne, Restigouche County, was the first found in New Brunswick since 1957.

	Reports	Collections
New Brunswick	0	1
Nova Scotia	1	0

54291-0—3

Alder Flea Beetle, *Altica ambiens alni* (Harris)—This insect caused varying degrees of skeletonizing of alder foliage throughout the Maritimes. The most severe attacks, many of them spotty, were observed in the following areas:

New Brunswick—Notre Dame, Norton, Hatfield Point, Waterford, and Urney road.

Nova Scotia—Washabuck Bridge, Nyanza, Port Hood, Havre Boucher, Sutherlands River to Mount Thom, from Alma through Pictou to Tatamagouche, Bayhead, Wentworth Valley, and from Milton to Caledonia.

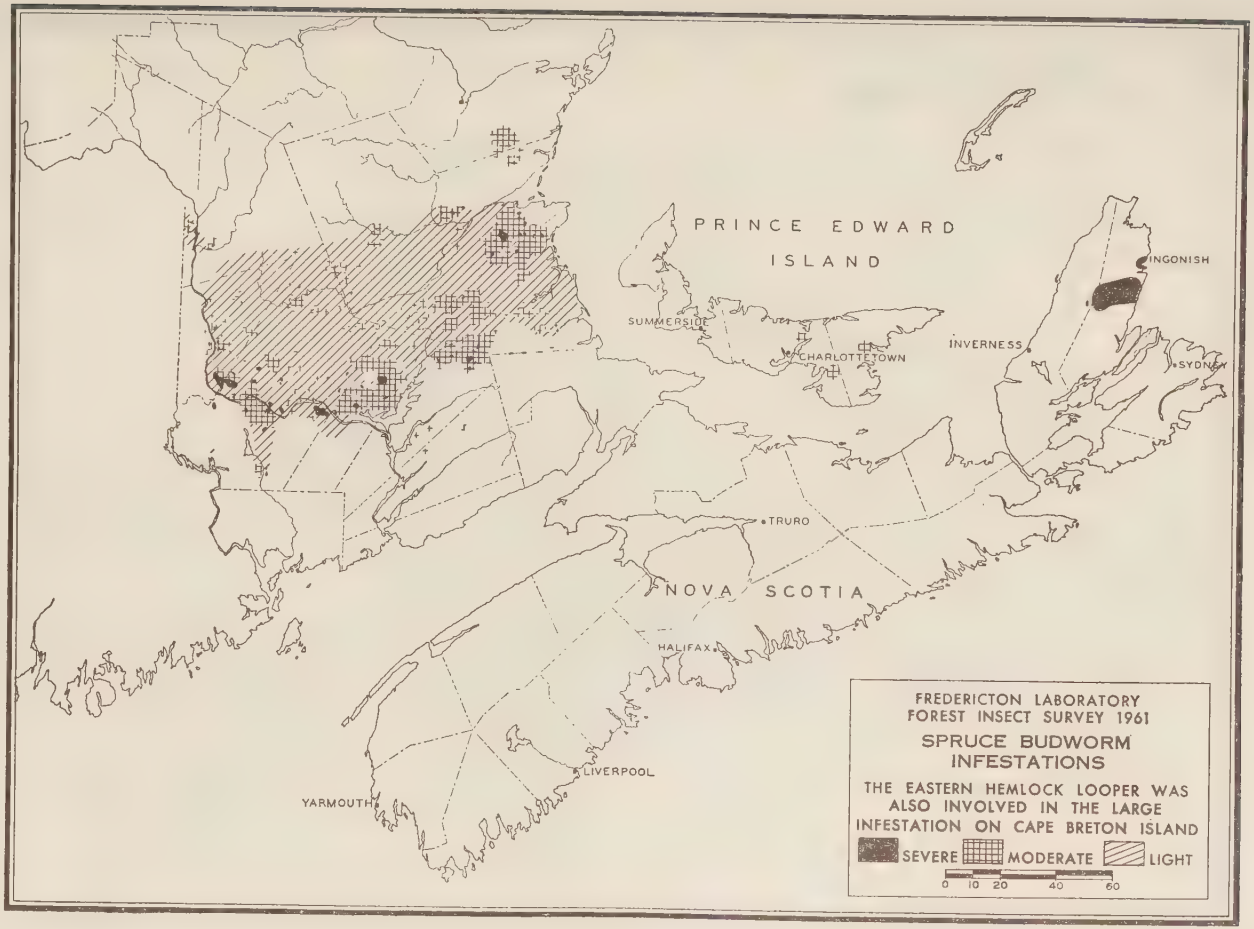
Prince Edward Island—Murray River and Little Sands.

	Reports	Collections
New Brunswick	3	2
Nova Scotia	4	12
Prince Edward Island	1	1

OTHER NOTEWORTHY INSECTS

Insect	Host	Locality	Remarks
Acleris variana (Fern.) Black-headed budworm	Balsam fir (foliage)	Maritime Provinces	Population levels low.
Argyresthia laricella Kft. Larch shoot moth	Tamarack (shoots)	12 scattered locations in N.B.	Population level 4 larvae/1000 shoots based on 15,674 shoots.
Dasyneura balsamicola (Lint.) and *Paradiplosis* sp. Gall midges	Balsam fir (new needles)	Maritime Provinces	Decreased to low population levels.
Dichomeris marginella Fab. Juniper webworm	Common juniper (foliage)	Swallow Tail Light, Grand Manan Island, N.B.	Severe localized infestation. First Survey record of insect in Maritimes.
Gracillaria syringella (F.) Lilac leaf miner	Lilac (foliage)	Scattered locations along Southwest Miramichi River and in coastal areas in Gloucester and Restigouche counties, N.B.	Light infestations continued.
Malacosoma americanum (F.) Eastern tent caterpillar	Miscellaneous deciduous hosts, mainly cherry and apple (foliage)	Maritime Provinces	Infestations generally light but severe in scattered areas.
Mindarus abietinus (Koch) Balsam twig aphid	Balsam fir (new needles)	Maritime Provinces	Common. Severe infestations at scattered locations in northern and central New Brunswick and on Grand Manan Island.
Neurotoma inconspicua (Nort.) Plum web-spinning sawfly	Pin cherry (foliage)	Fredericton, N.B.	First record in New Brunswick taken in 1958.
Phyllocnistis populiella Cham. Aspen leaf miner	Trembling aspen (foliage)	14 scattered locations in Region	Population levels generally low. Numbers were highest at Connors, Madawaska County, New Brunswick, where 53 of 418 leaves were mined.
Pristiphora geniculata (Htg.) Mountain-ash sawfly	Mountain ash (foliage)	Maritime Provinces	Common. Moderate defoliation at scattered locations.
Psilocorsis quercicella (Clem.) An oak leaf tier	Red oak (foliage)	Lunenburg, Queens, and Annapolis counties, N.S.	Common. Moderate infestation at Meisners in late summer.
Xylococculus sp.	Beech (bark)	St. Peters and Bonshaw, P.E.I.	First record in Prince Edward Island.

54291-O—31½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INGONISH
SYDNEY
TRURO
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HALIFAX
LIVERPOOL
YARMOUTH
FREDERICTON LABORATORY
FOREST INSECT SURVEY 1961
SPRUCE BUDWORM
INFESTATIONS
THE EASTERN HEMLOCK LOOPER WAS
ALSO INVOLVED IN THE LARGE
INFESTATION ON CAPE BRETON ISLAND
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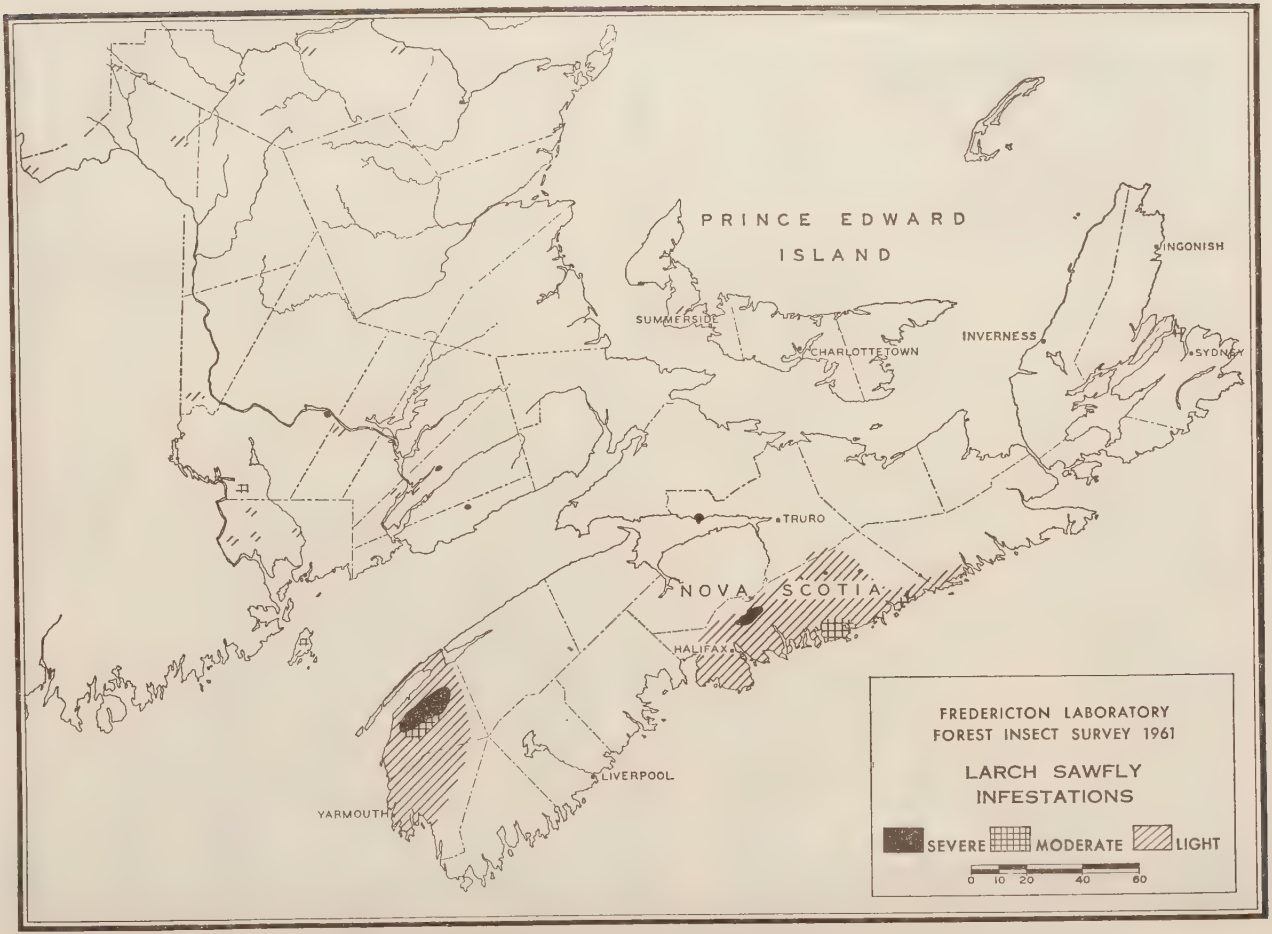
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TRURO
NOVA SCOTIA
HALIFAX
LIVERPOOL
YARMOUTH
FREDERICTON LABORATORY
FOREST INSECT SURVEY 1961
LARCH SAWFLY
INFESTATIONS
SEVERE
MODERATE
LIGHT
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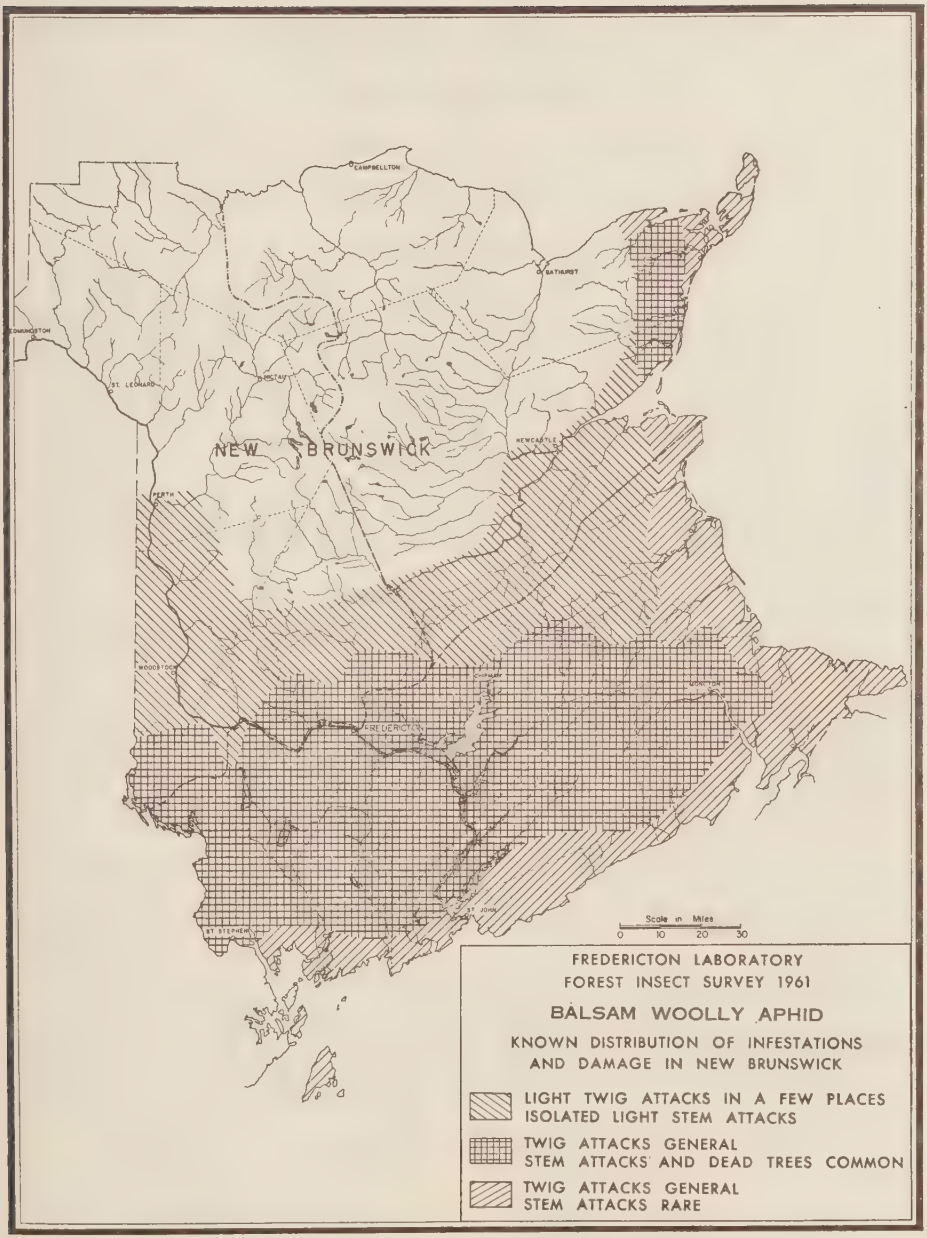
CAMPBELLTON
BATHURST
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ST. LEONARD
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NEW BRUNSWICK
NEWCASTLE
PERTH
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FREDERICTON
CHATHAM
MONCTON
ST. JOHN
ST. STEPHEN
Scale in Miles
0 10 20 30
FREDERICTON LABORATORY
FOREST INSECT SURVEY 1961
BALSAM WOOLLY APHID
KNOWN DISTRIBUTION OF INFESTATIONS
AND DAMAGE IN NEW BRUNSWICK
LIGHT TWIG ATTACKS IN A FEW PLACES
ISOLATED LIGHT STEM ATTACKS
TWIG ATTACKS GENERAL
STEM ATTACKS AND DEAD TREES COMMON
TWIG ATTACKS GENERAL
STEM ATTACKS RARE

MARITIME PROVINCES

FOREST DISEASE SURVEY

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INTRODUCTION

Although temperatures during the winter of 1961 were below normal, an adequate and persistent snow cover prevented extensive winter killing of deciduous trees and shrubs. Winter drying of conifers was also less prevalent than in previous years. Below normal temperatures in April delayed spring development of plants by about two weeks. Temperatures in May and June were close to normal but precipitation was generally above normal. Optimum conditions for foliage diseases occurred in localized areas and the intensity of these diseases varied greatly between localities. Late frosts were recorded in New Brunswick and Nova Scotia in June. July was dry with temperatures a few degrees below normal. For the second consecutive year, warm, dry weather prevailed in August and September. Injury to trees resulting from drought in 1960 was observed in New Brunswick and Nova Scotia.

The known limits of the Dutch elm disease in New Brunswick were increased by the discovery of infected trees in two additional counties.

Collections received during the year numbered 538 and were distributed among the principal tree hosts as follows:

Coniferous trees	Collections		Broad leaved trees	Collections	
Balsam fir		94	White elm		93
Spruce			Poplar		
White spruce	22		Trembling aspen	47	
Black spruce	17		Large tooth aspen	6	
Red spruce	12		Lombardy poplar	5	
Miscellaneous spruces	9		Miscellaneous poplars	5	
		60			63
Pine			Maple		
Jack pine	21		Sugar maple	17	
White pine	19		Red maple	14	
Red pine	7		Manitoba maple	10	
Scots pine	5		Miscellaneous maples	9	
Miscellaneous pines	2				50
		54			
Tamarack		10	Cherry		27
Eastern white cedar		4	Ash		19
			Willow		18
Total		222	Horsechestnut		11
			Birch		6
			Beech		2
			Miscellaneous		27
			Total		316

Grand Total 538

The Plant Research Institute, Ottawa, assisted with the identification of fungi and the Plant Protection Division, Saint John, N.B., assisted in the Dutch elm disease survey.

Wind Damage—In the 1960 Report, damage from Hurricane "Donna", which passed over the Maritime Provinces in September, 1960, was said to be confined to the breaking or uprooting of scattered trees. Subsequently, extensive damage to poplar trees, mainly trembling aspen and balsam poplar, has been reported in two areas of New Brunswick. Approximately 150,000 board feet were wind-thrown over an area of 2 square miles near Canoose Lake, Charlotte County, and approximately 25,000 board feet, on 50 acres near Magaguadavic Lake, York County.

Wind-thrown trees examined in August had produced and maintained a good complement of leaves. The cambium and bark of the trees were green and there was no evidence of insect attack or of staining and wood-rotting fungi.

Drought Injury—Dwarfed foliage on trembling aspen trees was common in southern New Brunswick and in Nova Scotia, particularly in Pictou and Colchester counties. Some of the twigs on the affected trees did not produce any leaves in 1961. Smaller trees and those growing on dry sites were most commonly affected. It is believed that the dry conditions that prevailed in August and September, 1960, were responsible for this condition.

Numerous dead branches, probably also the result of the drought in 1960, were observed on white birch trees near Baker Lake, Madawaska County, New Brunswick. In 1960, the leaves of these trees died and fell prematurely.

Frost Injury—In New Brunswick light to moderate injury to the current shoots of balsam fir and white spruce trees from late frost was observed in Madawaska, Northumberland, Queen's, Restigouche, St. John, Victoria, and York counties.

In Nova Scotia late frost caused light to moderate injury to balsam fir reproduction in the Big Intervale and Frizzleton areas of Inverness County. The current shoots of red spruce trees were lightly affected at Kempt Road, Richmond County, and at Debert, Colchester County.

Winter Drying of Conifers—Light to moderate damage to white pine trees from winter drying occurred in areas of Prince County, Prince Edward Island.

Reddening of balsam fir foliage, believed to be the result of this condition, was very noticeable in Nova Scotia on the plateaus of MacKenzie and French mountains, Inverness County.

Leaf Scorch—Leaf scorch was light on shade trees, particularly sugar maples, at localities in New Brunswick and Nova Scotia. Moderate browning of the leaves of open-grown trembling aspen trees occurred near Taymouth, New Brunswick.

Dutch Elm Disease—In 1961 the Dutch elm disease survey was again restricted to areas where the disease had not been found previously. The causal fungus, *Ceratocystis ulmi* (Buism.) C. Moreau, was isolated from 24 of 88 elm trees sampled. Diseased trees were found for the first time at the following 11 localities in New Brunswick:

Carleton County
- Debec
- Juniper

Madawaska County
- St. Hilaire

Queen's County
- Lower Sheffield

Sunbury County
- Fredericton Junction
- McGowan's Corner

Victoria County
- Arthurette

York County
- Canterbury Station
- Fredericton
- Lower St. Mary's
- Marysville

The discovery of diseased trees in Madawaska and Queen's counties has increased the known limits of the disease in the St. John River Watershed by approximately 60 miles (see map).

It is suspected that the diseased tree at St. Hilaire may have become infected as the result of the spread of the fungus from diseased trees in Maine. In 1960, a diseased tree was found in Fort Kent, Maine,[1] approximately 8 miles from St. Hilaire.

Willow Blight—In New Brunswick *Fusicladium saliciperdum* (All. & Tub.) Lind. and *Physalospora miyabeana* Fuk., the causal fungi of willow blight, were responsible for severe browning of the leaves of susceptible willow trees along the St. John, Nashwaak, and Magaguadavic rivers. Light to moderate browning was recorded in the Campbellton, St. Quentin, Bathurst, Grand Falls, Chatham, Blissfield, Jemseg, Salisbury, Sussex, St. Stephen, and St. George areas.

In Nova Scotia, browning was moderate or severe at Great Village, Portapique, Truro, and Bass River, Colchester County, and moderate in areas of the Annapolis Valley.

In Prince Edward Island moderate browning was observed on a few trees at Bunbury, Queens County.

Leaf and Twig Blight of Poplar—This disease of trembling and largetooth aspen, caused by *Pollaccia radiosa* (Lib.) Bald. & Cif., was generally light. Moderate or severe damage was observed only on a few trees in several areas of northern and central New Brunswick.

Ink Spot of Aspen—Ink spot of aspen, caused by *Ciborinia whetzelii* (Seav.) Seav., was common in northern and central New Brunswick. Browning of the leaves of trembling aspen trees was generally light, but occasionally moderate to severe, in small areas of Carleton, Gloucester, King's, Madawaska, Northumberland, Queen's, Restigouche, Sunbury, and York counties.

In Nova Scotia the disease was reported as common in one localized area at Debert.

Beech Bark Disease—A small increase in the number of trees cankered or killed by the beech scale, *Cryptococcus fagi* (Baer.), and *Nectria coccinea* var. *faginate* Lohm., Wats., & Ayers, was recorded on most of the 31 plots examined in New Brunswick and Nova Scotia.

X-Disease of Cherry—Dr. K. L. Callahan reported typical symptoms of x-disease on chokecherry bushes at several localities within 30 miles of Fredericton. This disease was reported on peach and chokecherry in Ontario in 1941[2] but this is believed to be the first report of its occurrence in the Maritime Provinces.

Leaf Blotch of Horsechestnut—This disease, caused by *Guignardia aesculi* (Pk.) Stew., was observed on horsechestnut leaves throughout southern New Brunswick, Nova Scotia, and Prince Edward Island. In Nova Scotia moderate or severe browning occurred along the South Shore from Mahone Bay to Liverpool, in the Annapolis Valley, and at Hebron, Lower Argyle, and Ohio, Yarmouth County.

In New Brunswick moderate browning was recorded on Grand Manan Island.

Ash Rust—Ash rust, *Puccinia sparganioides* Ell. & Barth., was common on the leaves of ash trees in Nova Scotia. Infections were generally light but

[1] Forest Pest Notes. No. 2, 1960. Division of Entomology, Maine Forest Service, Augusta, Maine.

[2] Berkeley, G. H. The x-disease on peach and chokecherry. Can. Hort. and Home Mag. Grower's Ed. 64 : 206, 220. 1941.

were moderate or severe at Portapique Mountain, Colchester County, Round Hill, Annapolis County, and Liverpool and Brooklyn, Queens County. No collections were made in New Brunswick and Prince Edward Island.

Cherry Blight—This disease of unknown cause was observed on pin cherry trees throughout most of New Brunswick, eastern Nova Scotia, and Prince Edward Island. The blight was light except in areas of Victoria and Colchester counties, Nova Scotia, where it was moderate on a few trees.

Canker and Dieback of Balsam Fir—Numerous dead and partially dead balsam fir trees, with reddened foliage, were very noticeable between Lyttleton and McGraw Brook, Northumberland County, New Brunswick. At least some of the mortality resulted from cankers and dieback caused by fungi. Late in the season, fruiting bodies, similar in appearance to those of fungi reported by Raymond and Reid[1] to cause a similar condition in Ontario, were observed on the stems and branches of affected trees.

Somewhat similar diseases of balsam fir trees occurred elsewhere. At New Germany, Lunenburg County, Nova Scotia, approximately 5 per cent of young recently pruned trees in a Christmas tree stand were killed, apparently by fungi causing cankers. Near Alberton and Cascumpeque, Prince County, Prince Edward Island, approximately 10 per cent of the new shoots were killed back, apparently also by fungi.

Eastern Dwarf Mistletoe—Severe infections by the eastern dwarf mistletoe, *Arceuthobium pusillum* Pk., were reported to have caused mortality of spruce trees in areas of Madawaska, Northumberland, York, and Queen's counties, New Brunswick, and Inverness, Richmond, Victoria, Halifax, and Digby counties, Nova Scotia. Severe damage was most extensive on Cape Breton Island, Nova Scotia.

Eastern Gall Rust—Galls on jack pine trees, produced by *Cronartium quercuum* (Berk.) Miyabe ex Shirai, were collected in areas of Kent, King's, Northumberland, Queen's, and Sunbury counties, New Brunswick. The rust appears to be common throughout most of the range of jack pine in New Brunswick.

Needle Rusts of Conifers—Moderate infections on red pine trees by *Coleosporium asterum* (Diet.) Syd. were observed on 1959 needles in a plantation at Princess Park, Queen's County, New Brunswick, and on 1960 needles in a plantation at Blue Mountain, Pictou County, Nova Scotia.

In Nova Scotia moderate or severe infections of current needles of balsam fir trees by rusts, *Milesia* or *Uredinopsis* spp., occurred at MacKenzie Mountain, Inverness County, Mount Pleasant, Victoria County, and Admiral Rock, Hants County. In New Brunswick a severe infection by *Pucciniastrum epilobii* Otth occurred at Chisholm Brook, Restigouche County.

Other rusts, *Chrysomyxa* spp., caused severe infections on the current needles of white spruce trees in small areas at Sherbrooke, near New Harbour, and Tor Bay, Guysborough County, and at Port Dufferin, Halifax County, Nova Scotia. Infections of species of spruce by *Chrysomyxa ledicola* Lagerh. were light to moderate between Longs Creek and Harvey Station, York County, and in a small area near Alma, Albert County, New Brunswick. A moderate infection by *Chrysomyxa ledi* de Bary occurred on black spruce near Upper Otnabog, Queen's County, N.B.

Anthracnose of Maple—Anthracnose of sugar maples, caused by *Gloeosporium apocryptum* Ell. & Ev., was observed in Carleton, King's, Madawaska,

[1] Raymond, F. L. and J. Reid. Dieback of balsam fir in Ontario. Can. J. Botany 39 : 233–251. 1961.

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Northumberland, Victoria, and York counties, New Brunswick, in Colchester and Cumberland counties, Nova Scotia, and in Queens County, Prince Edward Island. Browning was light and no defoliation was reported.

Anthracnose of Ash—*Gloeosporium aridum* Ell. & Ev. was responsible for light to moderate browning of white ash foliage at Dumfries, York County, and St. Andrews, Charlotte County, New Brunswick. Light damage occurred in Nova Scotia at North Lochaber, Antigonish County, at New Germany, Lunenburg County, and in New Brunswick at Fredericton.

Tip Blight of Balsam Fir—Several collections of this disease, caused by *Rehmiellopsis balsamae* Waterman, were taken in eastern Nova Scotia but infections were light. Collections were made also in Queens County, Prince Edward Island, and in Victoria and Queen's counties, New Brunswick.

Black Knot of Cherry—Black knots, caused by *Dibotryon morbosum* (Schw.) Theiss. & Syd., were common on pin cherry trees in New Brunswick particularly along the Pemouet River, Restigouche County, in the Moosebrook area, Northumberland County, and in the Loch Lomond area, St. John County.

Red Flag of Balsam Fir—Red flags, resulting from branch cankers probably caused by *Fusicoccum abietinum* Prill. & Delacr., were observed on balsam fir trees in widely separated areas of New Brunswick and Nova Scotia. The condition, however, was reported as very common only at Garland Mountain, Albert County, and Stanley, York County, New Brunswick.

Oak Leaf Blister—Oak leaf blisters, caused by *Taphrina caerulescens* (Mont. & Desm.) Tul., were observed in central and southern New Brunswick. Infections on red oak trees were light to moderate at Douglas, York County, Wiggins Cove and Gagetown, Queen's County, and MacDonald's Corner, Sunbury County.

Elm Leaf Spot—Severe infections by *Mycosphaerella ulmi* Kleb. caused light to moderate defoliation of white elm trees at Liverpool and Brooklyn, Queens County, Nova Scotia.

OTHER NOTEWORTHY DISEASES

Host	Organism	Locality	Remarks
Balsam fir	*Cytospora pini* Desm.	New Albany, N.S.	Associated with cankers. First record for Region.
	Kabatiella balsameae (J. J. Davis) v. Arx	West River, N.S.	On needles. According to Dr. D. B. O. Savile, this species has not been reported outside Wisconsin.
Maple, Manitoba	*Septomyxa tulasnei* v. Hoehn.	Bathurst, Blackville, Doaktown, Memramcook, Millerton, Sunny Corner, Tracadie, N.B.	Associated with dieback. First record for Region.
Maple, red	*Uncinula circinata* Cke. & Pk.	Bridgewater, N.S.	Powdery mildew. First Survey record.
Pine, white	*Cytospora pini* Desm.	New Albany, N.S.	Associated with cankers. First record for Region.

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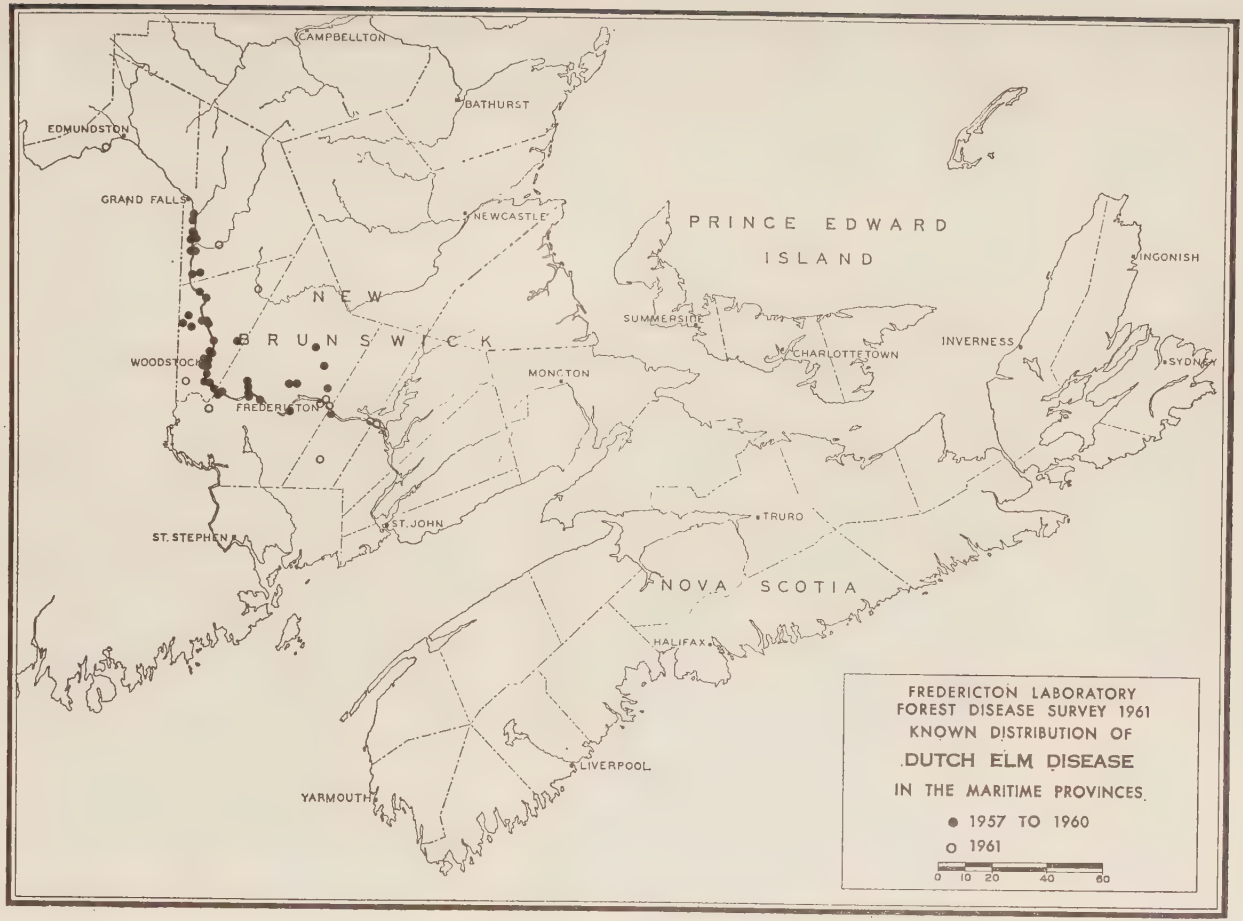
CAMPBELLTON
BATHURST
EDMUNDSTON
GRAND FALLS
NEWCASTLE
PRINCE EDWARD
ISLAND
N E W
B R U N S W I C K
SUMMERSIDE
CHARLOTTETOWN
INVERNESS
SYDNEY
WOODSTOCK
FREDERICTON
MONCTON
ST. STEPHEN
ST. JOHN
TRURO
NOVA SCOTIA
HALIFAX
LIVERPOOL
YARMOUTH
FREDERICTON LABORATORY
FOREST DISEASE SURVEY 1961
KNOWN DISTRIBUTION OF
DUTCH ELM DISEASE
IN THE MARITIME PROVINCES
● 1957 TO 1960
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PROVINCE OF QUEBEC

FOREST INSECT SURVEY

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INTRODUCTION

Insect development was generally retarded in 1961 due to unfavourable weather conditions through the first half of the season. The spring and early summer were unusually cool and humid with near normal conditions prevailing through late August and September.

There were no major changes in the status of important forest insects in the Province. Populations of the spruce budworm declined in several of the small infestation centres reported in 1960. The larch sawfly was again extremely abundant and although a decline in numbers was recorded in northwestern Quebec, the insect made appreciable gains in other regions. The jack-pine sawfly situation showed little change, and the European spruce sawfly was at its lowest level since 1955.

Moderate to severe infestations of the basswood looper developed in maple stands in Frontenac and Beauce counties, and the birch skeletonizer was unusually abundant in several regions. The 1961 gypsy moth egg survey revealed new infestation centres in southern Quebec and aerial spraying is anticipated for that region in 1962.

The following report of insect conditions in Quebec is based on observations by Survey personnel and other project workers at this Laboratory whose co-operation is gratefully acknowledged.

IMPORTANT INSECTS

Spruce Budworm, *Choristoneura fumiferana* (Clem.)—The budworm situation was characterized by a decrease in numbers, particularly in regions north of the St. Lawrence River. The Shipshaw River outbreak declined and only light defoliation was reported through the area severely infested in 1960. The small outbreak on the Ha Ha River was substantially reduced and moderate defoliation was restricted to an area of approximately 300 acres. A similar decline in numbers of budworm was evident in the small local outbreaks previously reported in Saguenay County.

In the Lower St. Lawrence and Gaspé, populations remained generally low for the third consecutive year. The residual outbreak in the Kedgwick-Mistigougèche-Patapedia area, covering approximately 121 square miles, was again sprayed. Post-spray surveys revealed either little or no defoliation except for a small sector adjacent to the treated area on the Patapedia River. Egg counts were made in 61 localities. High counts were restricted to four locations in the Patapedia River area where spraying of approximately 80 sq. miles has been recommended for 1962. Elsewhere egg counts were extremely light and no appreciable changes in the budworm situation are forecast for 1962.

Swaine Jack-pine Sawfly, *Neodiprion swainei* Midd.—Surveys of this sawfly were concentrated in western Québec. Adult emergence and larval development were delayed due to unfavourable weather and populations were substantially reduced. Of 40 sampling stations examined, the sawfly was found at

only 16 and in all cases defoliation was rated light. The present distribution follows closely that described in 1957 i.e. south of Senneterre in the Upper Ottawa, Mid-Gatineau, and Upper Lièvre River watersheds. West of this area a single report was received from Rapid Seven on the Ottawa River. The decline in sawfly numbers in this part of the Province may be attributed in part to the extensive salvage operations which have been carried out since 1957.

In the Lake St. John region, the infestation in Bégin and Falardeau townships was again active except in the 1960 virus-control area where the sawfly was rare. Many diseased larvae were found outside the treated area indicating some natural dissemination of the virus. The insect was again found in low numbers in the St. Maurice area.

Larch Sawfly, *Pristiphora erichsonii* (Htg.)—For the second consecutive year this was the most destructive and widespread forest insect occurring in the Province. A further increase in sawfly numbers was evident through central and eastern Québec. At some locations tamarack was completely stripped of foliage and a large portion of the larval population died of starvation. The increase in sawfly activity through this area was offset by a further decline of infestations in northwestern Quebec. However, there is some tree mortality in the Rouyn and Barraute areas as a result of successive years of defoliation. South of the St. Lawrence River and in eastern Québec, infestations were generally light with scattered stands having moderate defoliation.

Infestation ratings based on sequential sampling of egg populations* at 26 localities are summarized in the following table.

Region	No. localities sampled	Degree of Infestation			Trend 1961
		Light	Moderate	Severe	
Abitibi	5	2	2	1	Decrease
LaVérendrye Park	2	—	2	—	Decrease
North Montréal	7	6	1	—	No change
Drummondville	1	—	—	1	(New locality)
Laurentide Park–Charlevoix	4	1	1	2	Increase
Québec area	5	2	1	2	Increase
Southern Québec	2	2	—	—	Increase

European Spruce Sawfly, *Diprion hercyniae* (Htg.)—Sampling was again carried out at five permanent sample stations in southern Québec. At each location 20 trees were sampled in June and again in August at the peak of larval activity for the two generations. Although larvae were collected at all locations, their numbers were low, ranging from one to four per tree in the first generation and one to nine in the second. This represents the lowest counts recorded since 1955.

Some diseased larvae were found in all areas sampled. The disease was recorded in Launay Township, Abitibi-Ouest County, for the first time.

Basswood Looper, *Erannis tiliaria* (Harr.)—This general defoliator of hardwoods was common this year. Early signs of a new infestation were found in May at Laurierville, Lotbinière County. Later in the season a survey of sugar maple stands over an area of approximately 5,000 square miles showed a moderate-severe infestation zone of approximately 1,500 square miles centred near Thetford Mines and a lighter infestation covering the remainder of the territory. Up to 600 larvae per hour or 25 per 100 leaves could be collected at the peak of

*Ives, W. G. H. and R. M. Prentice, 1958. A sequential sampling technique for surveys of the larch sawfly Can. Ent. 90:331–338.

larval abundance in the moderate-severe zone. Despite the high larval populations during the early part of the season, defoliation never exceeded 25 per cent. Laboratory rearings revealed the presence of a virus disease, later observed in the field, which in some areas killed most of the older larvae. In areas of higher mortality, bacteria and fungi were also associated with the disease. This is the first report of this virus disease on the basswood looper.

Observations made on adult emergence in the fall revealed that the insect was still common and will be present in the same general area in 1962. An infestation was also reported along the Lower Gatineau River and another in the vicinity of Lake Champlain, but details on conditions in these areas could not be obtained.

Fall Webworm, *Hyphantria cunea* (Drury)—No significant change was recorded in the status of the fall webworm in 1961. The insect was again abundant west of the Chaudière River in southern Québec. Roadside tallies in St. Etienne and Lévis Counties revealed 119 nests per mile of road compared with 61 in 1960.

Larval colonies reared in the laboratory were all heavily parasitized. Seven species of parasites were recovered and five of them identified as follows: *Apanteles hyphantriae* Riley, *Meteorus hyphantriae* Riley, *Hyposoter fugitivus fugitivus* Say, *Mericia ampelus* Wlk., *Compsilura concinnata* Mg.

Gypsy Moth, *Porthetria dispar* (L.)—Aerial spraying against the gypsy moth in southern Québec was carried out by the Plant Protection Division, Canada Department of Agriculture. Insecticide was applied at six different infestation areas totalling 1,673 acres. Infestation forecasts for this species are based on fall egg surveys and male trap records. Male moths were recovered at only 17 locations this year which constitutes a substantial decrease from 1960. However, egg surveys revealed four new infestation centres in the following areas: southwest of Huntingdon, south of Dairy Valley, south of St. Chrysostome, and south of Standbridge Station. Spraying of these areas in 1962 is now being considered.

Birch Skeletonizer, *Bucculatrix canadensisella* Cham.—The occurrence of this insect was reported from the Gaspé Peninsula in the east through to the LaVérendrye Park in the west. Leaf counts were made in six representative localities on the south shore of the St. Lawrence River to determine the intensity of attack. In most cases over half of the birches were affected and approximately 80 per cent of the leaves examined showed signs of attack. At Mount Orford, Magog County, however, only seven per cent of the leaves were affected.

Bruce Spanworm, *Operophtera bruceata* (Hulst)—Only a few larvae were collected on aspen in the area of light infestation reported for L'Islet County in 1960. However, contrasting results were obtained in the same area in the fall when a number of emerging moths were trapped on banded aspen trees. Specimens of the basswood looper were also found in this area. This insect was equally common in sugar maple stands of southern Québec which may be indicative of an increase in numbers in 1962.

Ugly-nest Caterpillar, *Archips cerasivoranus* (Fitch)—Nests of this caterpillar were again numerous on cherry bushes in southern Québec and the insect was particularly abundant in some areas of the Eastern Townships. Counts of up to 131 nests per 1,000 square feet of roadside were recorded in the vicinity of Plessisville in Megantic County.

Poplar Sawfly, *Trichiocampus viminalis* (Fall.)—No appreciable change in the status of this sawfly was recorded. It was found in low numbers in all localities except Montmorency Falls, where it was somewhat more prevalent than in 1960. At St. Michel, Bellechasse County, and in the vicinity of Quebec City the virus disease previously reported played an important role in control of this species.

Poplar Leaf Miner, *Phytagromyza populicola* (Hal.)—This leaf miner was again unusually abundant. Sampling near Québec City showed that 50 per cent of leaves of aspen were heavily mined. This represents a slight increase over 1960.

Arborvitae Leaf Miner, *Argyresthia thuiella* Pack.—A severe infestation of this leaf miner was recorded in the Lake Memphremagog area. The abnormal colour of the foliage due to the mining of the leaves by the larvae, was most evident on hedges and ornamental plantings, but natural growing cedars surrounding the Lake also showed signs of attack.

Jack-Pine Needle Miner, *Exoteleia pinifoliella* (Chamb.)— Medium to heavy infestations were found in jack-pine plantations south of the St. Lawrence River between Montréal and Québec. The highest numbers occurred in 15-year-old plantings and both the old and the current needles were severely mined. In mixed pine plantations, red pine was lightly attacked but Scots pine showed no signs of damage.

Pine Leaf Aphid, *Pineus pinifoliae* (Fitch)—In July, 1961, abnormal shoot growth was reported on white pine reproduction in a two-story coniferous stand composed of white pine, jack pine, and black spruce at Lac des Loups in the LaVerendrye Park. Examination of the affected trees indicated a localized infestation of the pine leaf aphid. Twenty-two per cent of the trees examined were infested, many of them severely. The most severely affected reproduction fell in the 5 to 25-foot height class.

Linden Wart Gall, *Itonida verrucicola* O.S.—A severe infestation of this insect was recorded in the Mont Tremblant Park area in 1960. A substantial decrease occurred in 1961, but the trees still showed signs of the previous year's attack.

Bark Insects of Balsam Fir and Beech—Occasionally the presence of the balsam woolly aphid, *Adelges piceae* (Ratz.) has been reported in Québec, but the authenticity of such reports has been open to question. In the east this insect is known to occur in New Brunswick and all states bordering southern Québec. If present in this Province, it would likely occur in southern regions adjoining known infested areas. In August, 1961, a special reconnaissance was made in the higher concentrations of balsam fir of the counties bordering the United States from Dorchester in the east to Stanstead in the west. Observations were made in 30 localities and no sign of the insect could be found. Observations were also made in beech stands for a possible detection of the beech scale, *Cryptococcus fagi* (Baer.), but no positive results were obtained.

OTHER NOTEWORTHY INSECTS

Insect	Hosts	Locality	Remarks
Acronicta oblinita J. E. Smith.	Willow	St. Augustin, Portneuf Co.	First survey record.
Alsophila pometaria Harr.....	Maple, sugar	Ste. Foy, Québec Co.	Very low incidence. Known to defoliate maple periodically. Last infestation in 1957.
Altica carinata (Germ.).....	Elm, white	Sutton, Missisquoi Co.	Again abundant in the 1959 infested area.
Catocala cerogama Gn.....	Basswood	St. Benoit, Beauce Co.	Relatively common on this tree species in association with the basswood looper.
Cinara curvipes (Patch).....	Elm	Sutton, Missisquoi Co.	First survey record.

OTHER NOTEWORTHY INSECTS—Concluded

Insect	Hosts	Locality	Remarks
Diprion frutetorum (F.).....	Pine, scots	Shawinigan, St. Maurice Co.	Relatively common. Average of 9 larvae per tree in a 15-year-old plantation.
		St. Patrice, Lotbiniere Co.	Rare.
Epinotia nanana Treit.....	Spruce, white	Berthierville, Berthier Co.	Slight increase in numbers. Generally abundant in this district for a number of years.
Fenusa pusilla (Lep.).....	Birch, white	Central and western Québec	Severe damage caused to foliage every year and in normal years three generations are observed.
Fenusa ulmi Sund.....	Elm, white	Les Aulnaies, Kamouraska Co.	First survey record.
Itame loricaria julia Hlst.....	Aspen, trembling Maple, sugar	St. Aubert, L'Islet Co. Breakeyville, Levis Co.	Common throughout the Québec area.
Limenitis arthemis Dru.....	Maple, sugar Ironwood	Ste. Foy, Québec Co.	First survey record.
Malacosoma disstria Hbn.....	Maple, sugar	St. Sylvestre, Lotbiniere Co.	Apparent increase in the Québec City area and southern Quebec. Highest incidence since last outbreak in 1954.
		Ste. Foy, Québec Co.	" "
		St. Jean Port-Joli, L'Islet Co.	" "
		St. Ferdinand, Megantic Co.	" "
Neodiprion virginianus complex	Pine, jack	St. Urbain, Charlevoix Co.	Noticeable decrease in numbers.
Nymphalis antiopa Linn.....	Aspen, trembling Willow	St. Aubert, L'Islet Co.	Very common but heavily parasitized.
Paraclemensia acerifoliella (Fitch)	Maple	St. Benoit, Beauce Co.	Low incidence.
Vasates quadripedes (Shim.)...	Maple, silver	Québec, Québec Co.	Quite common on this tree species in several areas.
		Grand'Mere, St. Maurice Co.	" "
		Montréal	" "
Pineus strobi (Htg.).....	Pine, white	Huntingville, Stanstead Co.	Apparent increase in populations in the Eastern Townships.
		Coaticook, Beauce Co.	" "
Rhyacionia buoliana (Schiff.)..	Pine, mugho	Québec, Québec Co.	Lowest population record in the Québec infestation area in recent years.
Schizura concinna J. E. Smith.	Willow Aspen, trembling	Ste. Foy, Québec Co.	Light infestations in localized areas.
Sciaphila duplex Wlshm.....	Aspen, trembling	St. Aubert, L'Islet Co.	More common than usual.
		Ste. Foy, Québec Co.	"
		Breakeyville, Levis Co.	"
		St. Honoré, Beauce Co.	"
Stilpnotia salicis (L.).....	Poplar, Lombardy	Ste. Foy, Québec Co.	Presence recorded every year, last outbreak in 1953.

PROVINCE OF QUÉBEC

FOREST DISEASE SURVEY

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INTRODUCTION

A cool and wet spring characterized the early part of the growing season in Québec. The snow mantle persisted unusually late, and snow fall was recorded at the beginning of June in some areas. In most parts of the Province, except in the northeastern regions, fairly warm and humid weather prevailed from the last half of July to the end of September, the first frosts being recorded only towards the middle of October.

Late spring frosts in several areas, a few hail storms, and a tornado in the Laurentide Park caused extensive damage to trees. The ink spot disease of aspen and needle rusts on pines and balsam fir were the most prevalent foliage diseases in 1961. A variety of other leaf diseases were noteworthy, some of them being recorded for the first time in Québec. A *Valsa* species was observed associated with cankers on several white and Norway spruce trees in plantations.

The number of disease samples collected from the principal host trees are listed in the following table.

Coniferous Trees	Collections	Broad-leaved Trees	Collections
Balsam fir	77	Willows	23
Jack pine	38	Aspen	17
Black spruce	31	White birch	17
Red pine	27	Balsam poplar	12
Junipers	25	Red maple	9
White spruce	22	Sugar maple	8
White pine	19	Yellow birch	6
Pitch pine	17	Pin cherry	6
Eastern white cedar	16	White elm	5
Scots pine	14	Oaks	4
Norway spruce	9	Other maples	4
Other cedars	8	Other poplars	3
Red spruce	7	Beech	3
Larch	7	Others	32
Blue spruce	3		
Others	13	Total	149
Total	333		

Miscellaneous hosts 45

Grand Total 527

IMPORTANT DISEASES

Frost Injury—January was characterized, especially in the vicinity of Québec City, by almost continuous sub-zero temperatures. As a consequence of this prolonged period of intensive cold, frost cracks developed on numerous ornamentals, especially Carolina poplars, maples, and other deciduous trees. Flags in the crowns of planted white pine in Saint-Vallier and in red pine in Valcartier were thought to be due to frost damage.

Late frosts occurred in May and early June causing severe damage to trees in some districts. Severe bud-freezing was observed on white spruce trees in a 12-year-old plantation of approximately 12 acres in Lemieux, Lotbinière County.

Damaged white spruce trees contrasted sharply with other nearby planted conifers, such as black spruce, larch, and pines which had not been affected by low temperatures. Bud-freezing and terminal twig-freezing were observed on 2-inch- to 6-foot-high white spruce trees in a nursery at Grandes Piles, Saint-Maurice County; on approximately 10 per cent of trees in a plantation of a few acres at Drummondville; and on Norway spruce in a plantation at Saint-Paul-l'Ermite, L'Assomption County.

The death of almost all lower branches of jack pine in a plantation of approximately 10 acres at Valcartier, and of numerous 5-year-old Norway spruce and white cedar trees in a nursery at Parke Reserve, Kamouraska County, was another type of damage attributed to late frosts. Dying needles of both the spruce and cedar trees had been invaded by *Aureobasidium pullulans* (de Bary) Arnaud.

Late frosts also caused severe injury to the foliage of deciduous trees and shrubs. The damage included the deformation of leaves and the formation of ragged holes on already expanded leaves. The former injury was attributed to bud-freezing, while the latter resulted from dehydrated and necrotic areas where ice crystals had formed. Species of maple and oak were the most severly injured. Damage was observed to be general in the vicinity of Québec City, Montreal, Berthierville, Gigues (mainly on willows), Temiscamingue County, and Sherbrooke. It was also reported from Roberval, Roberval County. Although it was not possible to survey every region, it appears that this condition was widespread.

Ice Storm Damage—Freezing rains that resulted in the accumulation of thick layers of ice on trees occurred on February 26 in and around Montreal, and in the regions south of Montreal, extending from Huntington to Victoriaville. The weight of ice and accompanying high winds led to severe breakage of branches and stems of numerous trees, particularly poplars, maples, birches, and white elm.

Hail Damage—Heavy damage extending over areas of one to two square miles was observed in stands near Chapeau de Paille, Laviolette County; Clova, Abitibi County; and Saint-Lambert, Lévis County. Near Chapeau de Paille, balsam fir (the dominant species) was the most severely affected and numerous wounds from one to three inches in length caused the death of leaders, and of most of the branches with a northern exposure. Black spruce was the least severely affected, and white birch showed damage intermediate between that of balsam fir and spruce. The hail storm had apparently occurred on July 12, 1960. Damage was still more pronounced near Clova, following a storm which apparently had occurred at the end of June, 1960. In the focal area of damage, practically all leaders and branches of jack pine (the principal species), balsam fir, and aspen trees were killed. In addition, all alders in the area were dead. Black spruce was the least severely damaged. Cankers caused by different fungi had developed around wounds of one inch to several feet in length occurring on branches and stems of jack pine and aspen. Near Saint-Lambert, a hail storm which occurred on July 9, 1961, caused almost complete defoliation of the crowns of the dominant species (aspen, white birch, and red maple) and caused wounds ranging from 0.5 to 3 inches in length on branches and stems less than two inches in diameter. Wounds were also numerous on balsam fir, white pine, white spruce, and larch in the same area. Other storms occurred on July 9 in Québec City, and at Lac Sainte-Anne, Gaspé Park, on August 4, 1961, but damage was negligible in these areas.

Winter Drought—Winter drought damage was observed on numerous ornamental conifers, especially on red pine and eastern white cedar in Québec City. At the Drummondville Nursery, more than 1000 three-foot-high red pine trees were seriously damaged. Several 15-year-old red pine trees in a two-acre plantation at Beaupré, Montmorency County, and a few white spruce trees in the plantation of Cap-de-la-Madeleine were slightly damaged.

Wind-thrown Damage—A tornado occurred in the Laurentide Park on June 28. As a result, almost all trees in a ½ mile-wide strip extending westward 60 miles from highway 54, at approximately 30 miles north of l'Etape, were broken, twisted, or partially to completely uprooted.

Industrial Fume Injury—A general killing of trees, especially conifers, occurred in an area extending approximately 4½ miles west of Murdochville, Gaspé Peninsula. This condition was attributed to sulphur dioxide from smelter operations.

Armillaria Root Rot—The death of 60 of 139 white birch trees in a landscaped area in Thetford Mines, was caused by the *Armillaria* root rot disease. Similarly, numerous declining *Ribes alpinum* shrubs in a hedge at Sillery were affected by the disease. This disease also continued to spread in a young jack pine stand at Clova where it was first noticed in 1958. In a sample plot containing 204 jack pine trees, 131 had been killed by September, 1961.

Cytospora Canker on Spruce—Cankers and resin flow were observed on many dying white and Norway spruce trees in plantations at Grand'Mère and Lemieux, Lotbinière County. In the areas which have been surveyed of 7,000-acre plantation of the Consolidated Paper Corporation in Grand'Mère, at least 6 per cent of the trees were affected by the disease. Similarly, 14 of 35 Norway spruce trees in a landscaped area in Grand'Mère had cankers and resin flow. This condition has also been observed on spruce trees in plantations at the Proulx Nursery. A *Cytospora* species having a *Valsa* perfect state has been found associated with the disease. A similar fungus was found associated with white spruce trees in plantations at Lemieux (see also under ***Frost Injury***), on dying branches of two naturally regenerated black spruce trees in the Parc de La Vérendrye, and in Parke Reserve, Kamouraska County.

Cankers on Larch—Almost every larch tree (*Larix laricina*) in an area of approximately 1,500 square feet in a natural stand, 25 miles west of Laurier Station, Lotbinière County, was affected by trunk cankers. A *Cytospora* species was found associated with the cankers.

Ink Spot of Aspen—This leaf disease caused by *Ciborinia whetzelii* (Seav.) Seav. was by far the most important and widespread leaf disease in 1961. Heavy infections affecting from 10 to 80 per cent of the aspen foliage were observed in some areas at Forestville, Saguenay County; Lac Ha, Ha, Chicoutimi County; Rivière Bleue, Temiscouata County; and Sainte-Florence, Berry Mountain, and Saint-Bernard-des-Lacs in the Gaspé Peninsula. Several Lombardy poplars having approximately 50 per cent of the foliage infected have also been noticed in a forest tree nursery at Gigues, Témiscamingue County.

Needle Blight of white Pine—A browning of needles was observed on some 50 white pine trees of different ages in a natural stand at Champlain, Champlain County. In addition, a browning and dwarfing of needles and shoots was observed early in the spring on numerous white pine trees at the Valcartier plantation.

Needle Yellowing—A striking yellowing of 1-year-old needles of 13-year-old Scots pines was observed in late August in a 20-acre plantation near Lac Mégantic. The cause of this yellowing has not been determined. A less pronounced yellowing was noticed on 6-year-old Scots pine in a plantation at Saint-Eugène, near Drummondville, and on some 35-year-old Scots pine in Parke Reserve.

Needle Distortion—A distortion and stunting of needles and shoots was observed on numerous 6-year-old red pine in the plantation at Saint-Eugène. The cause of this trouble has not been determined.

Willow Blight—Although this disease was widespread in the Province in 1961, serious damage was limited to laurel willow trees in nurseries and hedges at New Carlisle, Gaspé Peninsula and on native willow at Fabre, Témiscamingue County.

Leaf Blight of Cedar—From one to five per cent of the foliage of eastern white cedar in ornamental plantings and natural stands around Memphremagog Lake were affected by the blight disease caused by *Keithia thujina* Durand. It also occurred in natural stands at Chandler and Lac Woodsmen in the Gaspé Peninsula.

A blight which appeared in September and affected up to 50 per cent of the current foliage of numerous northern white cedars was observed in Saint-Nicolas, and in areas around Rivière-du-Loup and Sainte-Anne-de-la-Pocatière. A pronounced shedding of the blighted branches suggested the effect of desiccation. The unusually high temperatures which were recorded in late August and throughout September could be partly responsible for this condition.

Needle Rusts—Needle rusts on spruces were not as pronounced this year as last year. Moderate infections of *Chrysomyxa ledicola* Lagerh. were observed on Colorado blue spruce at the Proulx Nursery; on black spruce in the Laurentide Park near Saint-Urbain; in the Chapeau de Paille area, Laviolette County; in New Richmond in the Gaspé Peninsula; along the Matapedia River in Saint-Alexandre, Kamouraska County; and in the Parc de La Vérendrye. Light infections by what appeared to be *Chrysomyxa chiogenis* Diet. were observed on red and black spruce at a few locations in the Gaspé Park. *Chrysomyxa ledi* de Bary var. *groenlandici* Savile or *cassandrae* (Peck & Clinton) Savile was responsible for light infections on the same species in Parke Reserve, Kamouraska County. Approximately 50 per cent of black spruce trees in a plantation of 5 acres at Lemieux were observed to have up to 50 per cent of their foliage infected either by *C. ledicola* or *ledi*.

Coleosporium asterum (Diet). Sydow infected up to 100 per cent of the 1960 needles of jack pine in a young plantation of approximately 16 acres in Saint-Etienne, Lotbinière County. Moderate infections by the same needle rust were observed on red and jack pines in a 10-year-old plantation of approximately 15 acres in Saint-Edouard, Lotbinière County, and in a small plantation of red pine near Saint-Armand, Missisquoi County. Other reports of light infections were on red and jack pines at the Valcartier plantations, on jack pines near Saint-Urbain, Charlevoix County, and on red pine near Magog.

Needle rust infections on balsam fir were heavy in some localities. *Pucciniastrum abieti-chamaenerii* Kleb. caused up to 85 per cent infection of the 1961 needles on balsam fir in a large area of an approximately 15-year-old stand at Chandler. Light to moderate infections by the same rust were general in and near the Gaspé Park. *Pucciniastrum epilobii* Otth was present on *Epilobium glandulosum* in some areas, and probably occurred on nearby fir. In areas near Lac Sainte-Anne, Gaspé Park, *Hyalopsora aspidiotus* (Peck) Magn. caused severe infections on *Dryopteris disjuncta*, but the rust could not be found on fir in the area.

Miscellaneous Leaf Diseases—*Ciborinia foliicola* (Cash and Davidson) Whetzel was found at several locations in 1961, including Clova, Gaspé Park, and Saint-Urbain, causing a leaf blight on two species of willow. In addition, *Coleosporium viburni* Arth. was collected at the following new locations, where heavy infections were observed: Park Reserve, Patapedia River, Clova region, and Saint-Hilarion, Charlevoix County.

Although not general in the Province, a variety of leaf-spots, blisters, and anthracnoses have been collected during the summer. These are listed below.

Host	Organism	Locality	Remarks
Alder	*Passalora bacilligera* (Mont. & Fr.) Mont. & Fr.	Rivière Sainte-Anne Montmorency Co.	Anthracnose. Heavy infection. First herbarium record.
	Phyllosticta sp.	Rivière Sainte-Anne Montmorency Co.	Heavy infection. First herbarium record.
	Phyllosticta sp.	Near Clova, Abitibi Co.	Heavy infection.
Ash, white	*Gloeosporium aridum* Ell. & Everh.	Sainte-Foy & Charlesbourg, near Québec City.	Heavy infection on some trees.
Aspen	*Venturia tremulae* Aderh. (*Pollacia radiosa* (Lib.) Bald. & Cif.)	General	Not abundant.
	Gloeosporium sp.	Near Clova.	Associated with a complete reddening of leaves. Heavy infection. First herbarium record and apparently first record in Québec.
Birch, white	*Phyllosticta* sp. probably *betulina* Sacc.	Near Clova, and Saint-Pascal, Kamouraska Co.	Heavy infection on some trees.
	Cylindrosporium betulae J. J. Davis	Rivière Sainte-Anne Montmorency Co.	Moderate infection. First herbarium record.
	Septoria betulicola Pk.	Lac Sainte-Anne, Gaspé Park	Heavy infection.
Maple, red	*Gloeosporium apocryptum* Ell. & Everh.	Sainte-Etienne Lotbinière Co.	Moderate infection.
	Phyllosticta minima (Berk. & Curt.) Ell. & Everh.	Sainte-Etienne Lotbinière Co. and Berthier, Berthier Co.	Moderate infection.
	Gloeosporium sp. possibly *decolorans* Ell. & Everh.	Gaspé Park	Moderate infection on young plants. First herbarium record.
	Septoria sp.	Berthier	Moderate infection. Associated with necrotic lesions along the veins.
Maple, sugar	*Gloeosporium apocryptum*	Québec City	Moderate infection.
Oak, red	*Taphrina caerulescens* (Mont. & Desm.) Tul.	Charlesbourg, Québec.	Twenty-five of 100 plants in a nursery reported to be heavily infected.
Poplar, balsam	*Linospora tetraspora* G. E. Thompson	Glendyke, Temiscouata, Co.	Heavy infection on regeneration.
	Venturia populina (Vuill.) Fabric. (*Pollacia elegans* Serv.)	Saint-Bernard-des-Lacs, Gaspé Co.	Heavy infection on regeneration, First record in Québec.
	Mycosphaerella populicola G. E. Thompson	Around Mont Albert, Gaspé	Heavy infection on regeneration.
Poplar, Lombardy	*Taphrina populina* Fr.	Gigues, Témiscamingue Co.	About a 30 per cent leaf-infection on a few hundred trees.
Prunus pennsylvanica	*Coccomyces hiemalis* Higgins	Gaspé Town and also along the Sainte-Anne River, Montmorency Co.	Very heavy infection.
Sambucus racemosus	*Ramularia sambucina* Sacc.	Along the Sainte-Anne River.	First herbarium record.
Willow	*Cylindrosporium salicinum* (Pk.) Dearn.	Near Clova.	Moderate infection. First herbarium record.
	Phyllosticta apicalis Davis	Rivière-Bleue, Témiscouata Co.	Moderate infection. First herbarium record.
	Ramularia sp. probably *rosea* (Fuckl.) Sacc.	Gaspé Town	Moderate infection. First herbarium record.
Ash, mountain	*Leucostoma cincta* (Fr.) v. Hoehn.	Charlesbourg, Québec	Associated with cankers on 35 per cent of 150 trees in a nursery.

Host	Organism	Locality	Remarks
Fir, balsam	*Aleurodiscus amorphus* (Pers. & Fr.) Rab.	Parke Reserve	Associated with branch cankers on a dozen of trees in a restricted area.
	Hypodermella mirabilis Darker	Rivière Sainte-Anne Montmorency Co.	Infecting almost 100 per cent of the 1961 foliage on sparse trees approximately 50 ft. tall.
	Kirschteiniella thujina (Peck). Pomerleau and Etheridge	Widespread	Causing a blue stain in fir and *Thuja*. A new combination proposed by Pomerleau and Etheridge for *Amphisphaeria thujina* (Pk.) Sacc.
	Milesia fructuosa Faull	Estcourt, Témiscouata Co.	Heavy infection on young regeneration.
	Trichosphaeria parasitica Hart.	Near Mont Albert, Gaspé	Heavy infection on some trees.
Juniperus plumosa	*Phomopsis juniperovora* Hahn.	Québec City	All plants (17) infected of a shipment from Holland.
J. sabina	*Phomopsis juniperovora* Hahn.	Québec City	Approximately 2.2 per cent of 780 plants infected in shipments from Holland.
	Gymnosporangium fuscum DC.	Québec City	On five plants intercepted in a shipment from Holland.
Pine, jack	*Hypodermella ampla* (J. J. Davis) Dearn.	Cap-de-la Madeleine, and Parke Reserve, Kamouraska Co.	Heavy infection on some trees in stands of more than a hundred acres.
	Cronartium comptoniae Arth.	Clova	About 10 per cent of 13-year-old trees in approximately 1 acre in a stand are infected with this rust.
Pine, red	*Therrya fuckelii* (Rehm) Kujala	Parke Reserve, and Parc de La Vérendrye	First record in Québec, and first herbarium record.
Poplar, Lombardy	*Dothichiza populea* Sacc. & Bres.	Gigues, Témiscamingue Co.	Approximately 350 trees infected in a nursery.
Pine, white	*Coccomyces strobi* Reid and Cain	Saint-Vallier, near Québec	First record in Québec, and first herbarium record.
Solidago graminifolia	*Coleosporium delicatulum* Hedgc. and Long	East Angus, Compton Co.	Abundant. Frist record in Québec and first herbarium record.
Spruce, red and white	*Trichosphaeria parasitica* Hart.	Gaspé Park, and Sainte-Catherine, Portneuf, Co.	Heavy infection on some trees.
Viburnum edulum	*Puccinia linkii* Klotzsch	Gaspé Park	Heavy infection. First herbarium record.

PROVINCE OF ONTARIO

FOREST INSECT SURVEY

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INTRODUCTION

Outbreaks of at least eight forest insects were of major importance in Ontario during 1961. Two extensive infestations of the spruce budworm that persisted in northwestern Ontario showed minor changes in extent, severity, and host tree mortality. A decline in infestation intensity is forecast for 1962. Widespread defoliation by the forest tent caterpillar and a further build-up of population levels occurred in the Western Region. There was a reduction in the intensity of defoliation by the larch sawfly in northern Ontario but considerable tamarack mortality was evident in some stands that have been under moderate to severe attack for six or less years. Widespread defoliation by the birch skeletonizer and the eastern tent caterpillar were reported. The European pine shoot moth, the European pine sawfly, and the root-collar weevil were major problems of pine plantations in southern Ontario.

Cold weather that prevailed during the spring and early summer in northeastern, central, and southwestern Ontario apparently favoured the survival of insects in protected environments such as the white pine weevil, the eastern tent caterpillar, *Zeiraphera* spp. on spruce, *Enargia decolor* Wlk., *Epinotia solandriana* Linn., *Zelleria haimbachi* Busck, and various leaf, needle, and bud miners. In contrast, developmental conditions were less favourable for open-feeding defoliators and their levels tended to remain static or to decline in the areas mentioned. Examples were: the orange-striped oakworm, most *Neodiprion* sawflies, and the forest tent caterpillar. In northwestern and in southeastern Ontario, weather for the same period approached average conditions.

Biological studies carried out by the Survey dealt with a new species of *Nepticula* on birch, the Nantucket pine tip moth, insects of spruce, parasites of the European pine sawfly, and general descriptions and identification of immature stages of forest insects.

The 8,448 collections received in 1961 contained an average of 1.5 species per collection. By far the largest number was received from Forest Research Technicians but many collections were also submitted by field personnel of the Ontario Dept. of Lands and Forests and of woods-operating companies whose co-operation and assistance we gratefully acknowledge.

Insect collections were distributed among the principal host trees as follows:

Coniferous trees	Collections		Broad-leaved trees	Collections	
Pine			Poplar		
Jack pine	1,047		Trembling aspen	766	
Red pine	273		Balsam poplar	149	
White pine	193		Largetooth aspen	27	
Scots pine	309		Miscellaneous poplars	44	
Miscellaneous pines	13				986
		1,835			
Spruce			Oak		
White spruce	994		Red oak	89	
Black spruce	343		White oak	29	
Miscellaneous spruces	47		Miscellaneous oaks	37	
		1,384			155

Coniferous trees	Collections
Eastern white cedar	172
Hemlock	36
Tamarack	494
Balsam fir	475
Juniper	9
Total	4,405
Miscellaneous hosts or hosts unspecified	119

Broad-leaved trees	Collections	
Birch		
White birch	760	
Yellow birch	24	
Miscellaneous birches	17	
		801
Elm		185
Maple		
Sugar maple	111	
Red maple	32	
Miscellaneous maples	52	
		195
Cherry		469
Willow		355
Alder		269
Mountain ash		157
Walnut, hickory		23
Ash		58
Basswood		86
Miscellaneous broad-leaved trees		185
Total		3,924

GRAND TOTAL 8,448

IMPORTANT INSECTS

Spruce Budworm, *Choristoneura fumiferana* (Clem.)—As shown on the accompanying map two major infestations of the spruce budworm persisted in northern Ontario. The larger, more than 6,500 square miles in area, extended eastward from Rainy Lake through the Fort Frances District to the borders of Kenora and Sioux Lookout districts in the north, and for a distance of approximately 25 miles into the southwestern part of the Port Arthur District. The smaller, approximately 500 square miles in area, occurred in the south-central part of the Geraldton District. These infestations showed only slight increases in area from 1960.

The larger infestation covered parts of four districts. In the Fort Frances District, defoliation of the current year's foliage of balsam fir was most severe from Sturgeon Lake in Quetico Park east to the Port Arthur District boundary with defoliation estimates ranging from 40 to almost 100 per cent. West of this area, heavy infestation also occurred but population levels declined slightly compared with 1960. A small area of heavy infestation, with defoliation estimated at about 80 per cent, extended from the Fort Frances District into the Kenora District at Eltrut Lake. To the east, a light infestation, with a few small pockets of moderate and severe defoliation persisted in the southern part of the Sioux Lookout District. The most noteworthy change in infestation intensities in the Port Arthur District occurred in the Shebandowan Lakes area where the narrow band of medium to heavy infestation which extended eastward toward Lower Shebandowan Lake in 1960 declined sharply in 1961. To the south, heavy infestations occurred eastward from the Fort Frances District beyond Titmarsh Lake and about four miles farther east than in 1960 to Mountain Lake along the international border. The balsam fir content in stands east of the present boundary diminishes greatly, thus accounting for the retarded spread of the infestation in the area during the past two years.

The smaller infestation was restricted to the Geraldton District where there was little increase in the total area of moderate to severe defoliation from 1960. An area of decline around Roslyn Lake about equalled the extent of a new medium to heavy infestation in the Steele-Kagiano-Killala lakes area and resulted in a northeastward shift in the location of infestations. A pocket of moderate defoliation was located along Halfway Road on the west shore of Long Lake. Maximum defoliation estimates exceeded 80 per cent at sample

points in these infestations. Egg surveys indicate that population levels will decline at least in the northeastern part of the infestation in 1962.

Pockets of light and medium infestation, occurring largely on white spruce, were reported in several other districts in Ontario. In the Lake Simcoe District, an infestation that had persisted for several years at Midhurst declined to light intensity, but populations returned from light to a medium level in a white spruce compartment of the Uxbridge Forest. Other localized light infestations were detected in the districts of Chapleau, Sudbury, Lake Simcoe, Lake Huron, and Lake Erie.

On the basis of egg surveys the outlook for 1962 is that moderate to severe defoliation will recur in the southeastern part of the Fort Frances District and in the southern part of the infested area in the Port Arthur District. A decline in the severity of attack is expected throughout the remainder of the large western infestation. Early indication of decline was noted in the high incidence of the budworm larval parasite *Meteorus trachynotus* Vier. around Kashabowie. In the Geraldton District, a decline is also forecast for 1962 especially in the northeastern part of the infestation.

Balsam fir tree mortality increased considerably in the eastern part of the Fort Frances District. At Sturgeon Lake, for example, mortality by volume increased from 2 to 48 per cent since the fall of 1960. Pockets of light mortality were evident in the southwestern part of the Port Arthur District where moderate to severe defoliation has occurred for five consecutive years.

The cause of balsam fir mortality among trees that had survived the budworm outbreak of the late 1950's in parts of the Sioux Lookout and Kenora districts is still not completely known. Mortality of this type is continuing at a low rate.

Jack-pine Budworm, *Choristoneura pinus* Free.—The heavy infestations of 1959 and 1960 in the north-central part of the Fort Frances District subsided in 1961. Meanwhile, new infestations, which tended to be heavy on ridges and hilltops and light on adjacent slopes and valleys, appeared northwest of Rainy Lake in the Fort Frances and Kenora districts. The largest of these covering about 50 square miles in the Fort Frances District, was located in the vicinity of Esox, Dogfly, and Bat lakes. In the Kenora District, numerous areas of defoliated jack pine occurred from Lower Manitou Lake in the south-central part of the District to Favel on the Canadian National Railway, a distance of approximately 70 miles.

In southwestern Ontario, there was a sharp increase in the number and intensity of infestations in jack and Scots pine plantations. In the Lake Huron District, medium infestations were noted on jack pine around Hepworth and in Beverly and North Dumfries townships. Medium to heavy infestations were observed on Scots pine at St. Williams, in Windham and Zone townships, Lake Erie District, and on both species of pines in the Brentwood-Camp Borden area of the Lake Simcoe District.

Larch Sawfly, *Pristiphora erichsonii* (Htg.)—Defoliation of tamarack by this insect in northern Ontario was generally lighter than in any year during the past decade. Sizeable areas of medium to heavy infestation were restricted to parts of the Sault Ste. Marie District, across the central part of the Geraldton District, and in the western part of the Kapuskasing District. A few pockets of heavy infestation were noted in the Fort Frances and Sudbury districts.

In southern Ontario, population levels were about the same as in 1960. Scattered areas of medium to heavy infestation occurred on tamarack in the districts of Parry Sound, Pembroke, Lindsay, Tweed, Kemptville, and Lake Huron. Medium to heavy infestations were reported in European larch plantations in Simcoe and Dufferin counties in the Lake Simcoe District. A number of infestations in the Lake Erie District increased from light to medium intensity.

Extremely high larval mortality occurred in northern Ontario and in localized areas in southern Ontario. In the north, oviposition and successful hatch was followed by the sudden "disappearance" of all young larvae so that light defoliation was frequently associated with high curled tip counts. A different type of larval mortality was important in the Lake Simcoe District. Here, dead, late-instar larvae littered the ground beneath defoliated trees. It was noticed first beneath European larch, and later, to a lesser degree, beneath tamarack. No known pathogen was found in the tissues of dying or dead larvae by the Insect Pathology Research Institute, Sault St. Marie, Ontario.

Considerable tamarack mortality was observed in the Cochrane and Swastika districts, where stands have been severely defoliated for six or less consecutive years. A contributing factor was the bark beetle *Dendroctonus simplex* Lec. which was present in both living and dead trees in these areas. This beetle has also been associated with the death of European larch and tamarack in the Lake Erie district during 1960 and 1961.

Forest Tent Caterpillar, *Malacosoma disstria* Hbn.—The present outbreak of this species is the tenth since 1867. It first became apparent in 1960 at two widely-separated locations, one in the Kenora District and the other in the Sudbury District. In 1961 population levels increased markedly in the Kenora and Sioux Lookout districts, but in the Sudbury District infestation intensities were sharply reduced because of high larval mortality.

Numerous pockets of medium to heavy infestation occurred in western Ontario. These were located in the areas of Sioux Narrows; six townships north of Eagle Lake; Redditt and Melick townships north of Kenora; Pakwash, One-legged, and Red lakes; Sioux Lookout and Hudson; and Moar Lake on the Ontario-Manitoba border.

Information collected during the year suggests that we may expect a considerable spread and coalescence of infestations in 1962 unless there is above average overwintering or spring mortality. This opinion is based on low parasitism in 1961, and high populations of adults and eggs. Parasitism of field-collected cocoons ranged from 14 to 30 per cent in Western Ontario as compared with values in excess of 95 per cent near the end of previous outbreaks. Furthermore, there was a marked increase in the number of *M. disstria* captured in light traps (see accompanying table), and heavy moth flights were reported from inhabited areas such as around Dryden. Numbers of egg bands per tree and the corresponding degree of defoliation forecast for 1962 are shown for five representative points in each of the Kenora and Sioux Lookout districts as follows:

Kenora District				Sioux Lookout District			
Location	Ave. d.b.h.	Ave. No. of egg bands per tree	Forecast for 1962*	Location	Ave. d.b.h.	Ave. No. of egg bands per tree	Forecast for 1962
Haycock Twp.	3″	1	L	Hudson	4″	14	S
Redditt Twp.	4″	12	S	Block 10	3″	15	S
Mutrie Twp.	5″	28	S	15 mi. W. of Ignace	4″	4	L
Langton Twp.	5″	25	S	5 mi. S. of Red Lake	3″	3	L
Aubrey Twp.	5″	7	M	Long-legged Lake	4″	34	S

*L—light, M—moderate, and S—severe defoliation.

The heavy infestation around Whitewater Lake in the Sudbury District was greatly reduced to an area of only 10 acres compared with approximately 90 square miles in 1960. It is thought that unseasonably cold weather (3.3° F.

below normal in May) and high concentrations of sulphur fumes between the time eggs hatched (May 8) and the larvae commenced to feed accounted for the extremely high larval mortality. According to records of the Sulphur Fumes Arbitrator, Ontario Dept. of Mines, Sudbury, concentrations in excess of 1 p.p.m. in air occurred in this area on May 11 and 15 for a total period of two hours. Farther west along Highway 17 in Graham Township, a small pocket of heavy infestation was observed.

Light infestations were observed at widely-scattered points in the Fort Frances, Parry Sound, and Pembroke districts, and colonies of larvae were collected in many other districts where in recent years only small numbers of larvae were found.

Light traps were used again in 1961 to determine the relative frequencies of moths of *Malacosoma* spp. present at eleven points throughout the Province. As shown in the following table many more forest tent caterpillar moths were captured than in 1960. The take of 262 moths, all males, at Black Sturgeon Lake Field Station southwest of Lake Nipigon, is of particular interest since no infestations were detected this year in the Port Arthur District.

District	Number of moths captured					
	M. americanum		*M. disstria*		*M. pluviale*	
	1960	1961	1960	1961	1960	1961
Sioux Lookout	0	0	37	1,252	9	79
Kenora	—	0	—	262	—	0
Port Arthur	—	0	—	262	—	56
Geraldton	0	0	3	11	0	0
Sault Ste. Marie	0	0	11	8	0	0
Chapleau	0	0	0	0	12	4
Kapuskasing	—	0	—	1	—	0
Swastika	0	0	2	1	0	0
Parry Sound	26	34	14	42	0	0
Kemptville	71	272	16	58	0	0
Sudbury	25	—	16	—	0	—
Total	122	306	99	1,897	21	139

Eastern Tent Caterpillar, *Malacosoma americanum* (F.)—The build-up in population levels of this insect in parts of central and southern Ontario each year since 1958 was particularly noticeable in 1961. The average and highest numbers of tents counted at each sampling station increased in all districts within the insect's range, from the southern part of the Sault Ste. Marie District eastward to the North Bay District and southward throughout the remainder of Ontario.

In some of the heavy infestations in the districts of Parry Sound, Pembroke, Lake Simcoe, Lake Huron, Lindsay, and Tweed, larvae migrated from defoliated cherry trees to other deciduous species such as aspen, oak, willow, birch, and maple.

The numbers of overwintering egg clusters on roadside shrubs in some areas indicate further intensification of the general outbreak in 1962; for example, along Highway 103 in the Parry Sound District a 40 per cent increase in the number of colonies is anticipated. Furthermore, higher numbers of moths were captured in light traps in the Kemptville District than in 1961.

District	Number of tents per mile of roadside					
	Average count			Highest count		
	1959	1960	1961	1959	1960	1961
Sault Ste. Marie	1	1	3	1	1	5
Sudbury	1	4	17	1	6	23
North Bay	2	4	11	2	7	14
Pembroke	6	11	25	14	22	62
Parry Sound	14	30	45	22	79	91
Lake Simcoe	7	16	43	12	29	96
Lake Huron	21	28	19	63	86	97
Lake Erie*	3	2	4	5	4	11
Lindsay	14	35	60	84	137	364
Tweed	5	16	34	10	87	121
Kemptville	2	4	10	5	12	40

*Counts made in a localized infestation in Bosanquet Twp., Lake Erie District have been excluded.

Western Tent Caterpillar, *Malacosoma pluviale* (Dyar)—With few exceptions, the general frequency of tents on cherry shrubs throughout the range of the western tent caterpillar in northern Ontario has remained low since the last reported outbreak in the Swastika District, from 1948 to 1950. The only infestations reported in 1961 were in the northern half of Mobert Division in the White River District, where colonies on roadside trees were as high as 62 per mile.

European Pine Sawfly, *Neodiprion sertifer* (Geoff.)—This introduced pest of pine is now known to occur throughout most of the Lake Huron and Lake Erie districts and in the Lake Simcoe District west of a line joining Penetanguishene, in Simcoe County, and Leaside, east of Toronto. It has also become established along the shore of Lake Ontario from Leaside east to Whitby. Compared with the known distribution in 1959, it is evident that the eastward spread of the insect is continuing at a rate comparable to that of past years in both the Lake Simcoe District and on the Niagara Peninsula (see accompanying map). Of even greater concern is the discovery in 1961 of three spot infestations in the Southeastern Region; namely, near Orono in Durham County, Centreton in Northumberland County, and at Belleville in the Tweed District. These new infestations apparently resulted from the introduction of infested nursery stock.

Damage was reduced to tolerable limits in many Scots and red pine plantations by the use of chemical and virus insecticides. In others, however, heavy infestations persisted. Severe defoliation of the old foliage was noted in Caledon, Toronto, and East Garafraxa townships in the Lake Simcoe District, numerous townships in the northern half of the Lake Huron District, and in Romney and Zone townships in the Lake Erie District.

European Pine Shoot Moth, *Rhyacionia buoliana* (Schiff.)—The European pine shoot moth was again common on Scots and red pines south of a line from the tip of the Bruce Peninsula to Kingston. Medium or heavy infestations were reported in the following counties: Lambton and Elgin, Lake Erie District; Wentworth, Lake Huron District; Dufferin, Simcoe, and Ontario, Lake Simcoe District; Durham, Lindsay District; and Prince Edward and Frontenac, Tweed District.

The distribution of the shoot moth in southwestern Ontario has remained virtually static since 1953. Isolated infestations, which have appeared periodically in more northerly areas, were short lived; for example, the light infestations that were reported in the Sault Ste. Marie District in 1960 disappeared due to

larval mortality caused by severe cold in December. Temperatures of —19° F. were recorded in the area during the first full week of December when there was little or no snow to protect over-wintering larvae.

Birch Skeletonizer, *Bucculatrix canadensisella* Chamb.—The current outbreak of this insect originated in the Lake Erie District in 1956. Since that time a remarkable increase in population levels has occurred in southern and central Ontario. In 1961, severe defoliation of white birch occurred over a large part of southern Ontario and through the southern part of the North Bay, Sudbury, and Sault Ste. Marie districts. The foliage of affected stands turned brown in late summer and dropped prematurely. Although the damage caused by the insect is spectacular, it occurs after most of the seasonal growth of the trees has taken place, and therefore little or no permanent injury has resulted.

Pine Root-collar Weevil, *Hylobius radicis* Buch.—Although there were many inquiries on the root-collar weevil in 1960 and 1961, investigations and surveys so far indicate that infestations of this serious pest of pines are still restricted to Simcoe County, Lake Simcoe District; Westmeath Township, Pembroke District; and McAuley Township, Parry Sound District. Numerous heavy infestations persisted in Simcoe County and caused considerable Scots pine tree mortality in Essa, Sunnidale, Tosorontio, and Tiny townships. One of two infestations in Westmeath Township intensified and enlarged to include a third Scots pine plantation.

White-pine Weevil, *Pissodes strobi* (Peck)—Despite extensive control measures against the white-pine weevil in Ontario, it remains a serious deterrent to the successful establishment and management of white pine plantations on marginal agricultural areas and clear cut land. Current attack, exceeding 30 per cent, was recorded in five white pine plantations located in Oro and East Gwillimbury townships, Lake Simcoe District; part of the La Rose Forest, Kemptville District; Buchanan Township, Pembroke District; and Van Horne Township, Kenora District. Instances of less than 30 per cent attack were common. As in former years, white and Scots pines were the most common hosts in southern Ontario, and in the boreal region the frequency of weevil damage was noted in the following order: jack pine, black spruce, white spruce, and Scots pine.

In the Kirkwood Management Unit, Sault Ste. Marie District, a concerted effort was made to reduce weevil numbers in white pine plantations by means of aerial spraying, hand spraying, and the clipping and burning of infested leaders. Aerial spraying covered about 400 acres of white pine, and as a result weevil attack on terminals was reduced from about 10 to 21 per cent in 1960 to slightly less than one per cent in 1961. The highest incidence of weevilling on other tree species in the District was as follows: open-grown white pine- 60 per cent, mugho pine- 27 per cent, Scots pine- 20 per cent, white spruce- 9 per cent, red pine- 9 per cent, and jack pine- 6 per cent.

Northern Pine Weevil, *Pissodes approximatus* Hopk., and ***Pales Weevil,*** *Hylobius pales* (Hbst.) These weevils constituted an important problem following the harvesting of Christmas trees, particularly in parts of southwestern Ontario and the Parry Sound District. However, application of sodium arsenite to recently cut stumps of Scots pine showed considerable promise as a means of reducing weevil numbers. Both species of weevil also contributed to the death of Scots and red pine trees severely damaged by the root-collar weevil in parts of Simcoe County.

There was a high incidence of *P. approximatus* larvae in weakened or killed red pines in plantations of the Sault Ste. Marie and Cochrane districts. In the latter district, the weevil also killed white spruce trees that had been attacked previously by the white pine weevil.

Red-headed Pine Sawfly, *Neodiprion lecontei* (Fitch)—As with several other *Neodiprion* sawflies, the numbers of larval colonies and infestations were the lowest noted in several years. This applied particularly to the Central and South-central regions, where only single scattered colonies were found. Pockets of heavy infestation were restricted to Manvers, Clarke, Cramahe, and Asphodel townships, Lindsay District; Lanark Township, Kemptville District; and Oro Township, Lake Simcoe District.

Red-headed Jack-pine Sawfly, *Neodiprion virginianus* complex—A downward trend was apparent in the numbers of this sawfly. Fourteen per cent of all collections from jack pine contained this sawfly in 1961, as compared with 23 per cent in 1960 and 20 per cent in 1959. Moderate to heavy infestations were restricted in southern Ontario to two areas in the Lake Simcoe District, and, in northeastern Ontario, to several locations in the Kapuskasing and Cochrane districts. In the Mid-western and Western regions, the downward trend was less apparent. Moderate infestations were reported in two townships of the Port Arthur District and heavy infestations, at two points in the Fort Frances District.

Balsam-fir Sawfly, *Neodiprion abietis* complex—Populations of this insect throughout the Province returned to levels equal to those of 1959 following a general decline in 1960. Sharp increases in the number of colonies per tree were reported in Somerville Township, Lindsay District; Bangor Township, Tweed District; on Bruce Peninsula, Lake Huron District; in Johnson and Parkinson townships, Sault Ste. Marie District; on an island in Shoal Lake, Kenora District; and in McCrosson Township, Fort Frances District. Fewer colonies were present in the Cochrane and Kapuskasing districts than in 1960.

Introduced Pine Sawfly, *Diprion similis* (Htg.)—A medium infestation of this insect occurred on Scots and jack pine plantings along the Queen Elizabeth Highway north of Niagara Falls for the second consecutive year. In contrast, population levels declined sharply in the Lake Simcoe District, where the insect had increased in numbers in 1960. Larval counts were low in the northern half of the Lake Huron District.

Black-headed Jack-pine Sawfly, *Neodiprion pratti banksianae* Roh. and ***A Sawfly,*** *Neodiprion pratti paradoxicus* Ross—Recent studies of *Neodiprion* sawflies by Mr. D. R. Wallace have made possible the identification of different larval types on jack pine formerly included in Survey reports under *N. pratti banksianae*. Based on collections received in 1961, *N. pratti banksianae* occurs in northwestern and northeastern Ontario and *N. pratti paradoxicus* Ross occurs in southeastern Ontario in the districts of Pembroke, Kemptville, and Tweed. In the intermediate zone, i.e., from the southern part of the Sault Ste. Marie District eastward to the North Bay District and including the districts of Parry Sound, Lake Simcoe, and Lake Huron, colonies of both *N. pratti banksianae* and intermediates between the two sub-species were collected. *N. pratti paradoxicus* was also found near Sault Ste. Marie.

The only heavy infestations reported were of *N. pratti paradoxicus* in two jack pine plantations in the Tweed District, near Marmora and Flinton.

Swaine Jack-pine Sawfly, *Neodiprion swainei* Midd.—Only three per cent of insect collections taken from jack pine in 1961 contained specimens of the Swaine jack-pine sawfly. Corresponding percentages for 1959 and 1960 were 9 and 5 respectively, indicating a downward trend in numbers of this species outside of areas where infestations have been followed for some years. These known infestations occur at Banks Lake on the border that separates the districts of North Bay and Swastika and on islands in Rabbit Lake, North Bay District. The infestations at both locations declined to moderate intensity in 1961.

Red-pine Sawfly, *Neodiprion nanulus nanulus* Schedl—In general, population levels of this insect were again low throughout the Province. However, slight increases in numbers were detected on red pine in the districts of Parry Sound and North Bay, with an average of up to eight colonies per tree reported in the latter district. Heavy infestations on jack pine were reported in Ramsay Wright Township and along the northeast shore of Cache Bay in the eastern part of the Fort Frances District.

European Spruce Sawfly, *Diprion hercyniae* (Htg.)—The discovery of this introduced insect in the Kapuskasing and Kenora districts in 1961 represented a considerable extension of the known range in Ontario. Small collections from Gill Township in the Kapuskasing District and from three widely-separated locations in the Kenora District indicate that the sawfly is spreading gradually throughout the boreal forest region.

A review of Survey reports since 1936 indicates that the insect entered Ontario in the Temiskaming area from Quebec, in southern Ontario from New York State, and in western Ontario from the State of Minnesota. In 1946, it occurred commonly in southern Ontario and as far west as Sudbury in central Ontario. In 1947, it was collected for the first time in the Sault Ste. Marie District, and in 1950, it occurred in small numbers in the southern part of the Fort Frances District. Since 1950, it has moved gradually westward and northward into adjacent districts, and the known distribution now includes all forest districts of Ontario except Sioux Lookout.

The variation in larval population levels has generally shown a fairly narrow range of amplitude during the period of its occurrence in Ontario, and at no time has it caused appreciable defoliation.

Mountain-ash Sawfly, *Pristiphora geniculata* (Htg.)—In recent years, there has been a gradual northward spread of this introduced insect in northeastern Ontario. In 1961, the sawfly was found as far north as Garrison Township, south of Lake Abitibi, and in Guilfoyle Township, north of Kapuskasing. Farther west the northward spread has been slower, having reached Wawa in the White River District in 1960 and De Gaulle and Blewett townships in the Chapleau and Gogama districts respectively in 1961. In other districts to the south, scattered pockets of medium and heavy infestations were reported.

A Leaf Miner on Birch, *Profenusa thomsoni* (Konow)—Heavy infestations of this blotch miner have persisted for several years in northeastern Ontario, causing discoloration and premature leaf-drop in white birch stands.These conditions were particularly striking in 1961 in the South Porcupine and Cochrane areas as well as around Hornepayne, Remi Lake, and Kapuskasing. Small but heavy infestations occurred in the Chapleau District, at three locations in the Swastika District, at four locations in the southern part of the White River District, and near Pays Plat in the Geraldton District. A small number of collections verified the presence of this insect in the Mid-western and Western regions.

A Leaf-folding Sawfly, *Nematus* sp.—Infestations of this sawfly on poplar continued to subside throughout the Province, with a few noteworthy exceptions. In the Parry Sound District, population indices increased at most sample points with counts of 1.03 and 0.83 folds per leaf being recorded in Muskoka and Spence townships respectively. High population levels continued in the Southeastern Region.

Balsam Shoot-boring Sawfly, *Pleroneura borealis* Felt—Damage caused to the developing shoots of balsam fir by this species was rare in 1961. This follows a consistent pattern evident since 1956 of high numbers occurring in

alternate years and suggests a recurrence of damage to open-grown balsam fir trees in 1962. In both 1958 and 1960, infestations were heaviest in the Central and South-central regions.

A Tortricid on Oak, *Argyrotoxa semipurpurana* Kft.—Medium to heavy infestations of this insect occurred on red oak in the Sault Ste. Marie, Lake Simcoe, and Lindsay districts in 1961. This is the fourth consecutive year of severe defoliation in parts of Tarentorous, Korah, Prince, and Parke townships west of Sault Ste. Marie. East of Sault Ste. Marie, a small new area of heavy infestation was observed in Indian Reservation Number 12. In the Lake Simcoe District, pockets of severe defoliation recurred in Vespra Township, but infestations in Dufferin County showed a marked decline. In the Lindsay District, red oak trees over an area of approximately two square miles in Clarke Township suffered moderate defoliation.

Spring Cankerworm, *Paleacrita vernata* (Peck)—Heavy infestations of this pest of elm persisted for the second consecutive year in many parts of Grey County, Lake Huron District, but in Elma Township, Perth County, the heavy infestation reported in 1960 declined to light intensity. In the Lake Simcoe District, moderate to severe defoliation of white elm trees occurred in Oro, Caledon, Sunnidale, and Nottawasaga townships.

Fall Cankerworm, *Alsophila pometaria* (Harr.)—This insect caused severe defoliation of elm and other broad-leaved trees at numerous locations in southern Ontario. These were located in the Binbrook area and along Highway 6 between Chatsworth and Durham, Lake Huron District; Toronto, Vespra, and Caledon townships, Lake Simcoe District; Caistor and Gainsborough townships, Lake Erie District; and Clarke, Manvers, Cavan, and Hope townships, Lindsay District.

Orange-striped Oakworm, *Anisota senatoria* (J. E. Smith)—Severe defoliation of oak trees occurred in the same general areas of southeastern Ontario as in 1960. Noteworthy infestations were reported along the Trent Canal near Campbellford in the Lindsay District and in Sidney, Thurlow, and Tyendinaga townships in the Tweed District. Populations declined at a low level in southwestern Ontario.

Basswood Looper, *Erannis tiliaria* (Harr.)—This looper, which was frequently associated with spring and fall cankerworms in southern Ontario, was more numerous than in 1960 on a number of deciduous hosts. Pockets of heavy infestation were reported in the southwestern part of the Lindsay District, in the west-central part of the Tweed District, in the eastern part of the Lake Erie District, and on Manitoulin Island.

Walnut Caterpillar, *Datana integerrima* G. and R.—Population levels increased in all counties bordering Lake Erie and Lake Huron in the Lake Erie District, where numerous heavy infestations were reported on black walnut. Medium to heavy infestations persisted in the western and southern counties of Lake Huron District.

A Noctuid, *Enargia decolor* Wlk.—Heavy infestations of this insect occurring on trembling aspen in Ontario since 1959 have been of short duration. Population levels declined sharply in the Western Region in 1961, but heavy infestations occurred in parts of the Chapleau, Gogama, and Sudbury districts. The largest of these was in the southeastern part of the Chapleau District and the northern part of the Sudbury District. In the former area, trembling aspen trees in all age classes were severely defoliated, whereas in the latter area, pole-size trees and reproduction were mainly affected. Severe defoliation of understory aspen also occurred along Highway 69 in the northern part of the Parry Sound District.

A Poplar Leaf-roller, *Epinotia solandriana* Linn.—This insect occurred commonly in southern Ontario and in all districts east of Lake Superior in northern Ontario. Numerous pockets of heavy infestation were observed on trembling aspen in the Lake Simcoe District, at three locations in the Lake Huron District, and in one small stand in the Tweed District.

Fall Webworm, *Hyphantria cunea* (Drury)—Population levels of this insect showed a general decline. Localized heavy infestations persisted in Elmsley and Drummond townships in the Kemptville District, Sidney and Madoc townships in the Tweed District, and Ross Townships in the Pembroke District. Ash, elm, black cherry, and walnut were the principal hosts.

Spruce Bud Moth, *Zeiraphera ratzeburgiana* Ratz.—A complex of insects including mainly *Z. ratzeburgiana* but with smaller numbers of *Z. fortunana* Kft., *Zeiraphera* sp., *Griselda radicana* Wlshm., *Eucordylea* sp., and *Eucordylea atrupictella* Dietz damaged the developing shoots of open-grown white spruce trees at an increased number of localities. Pockets of heavy infestation were reported as follows: in Eldon and Haldimand townships, Lindsay District; in the southern part of the Sudbury District; especially on Manitoulin Island; in Thompson Township, Sault Ste. Marie District; and in O'Connor Township, Port Arthur District.

Black-headed Budworm, *Acleris variana* (Fern.)—The numbers of black-headed budworm in balsam fir and spruce stands had been on the increase for several years. Virtually no change was noted in 1961, although the insect was again common in "beating" samples.

Spruce Bud Midge, *Rhabdophaga swainei* Felt—Infested buds were observed commonly on black and white spruce trees throughout Ontario. The highest frequency of attack in various forest districts, based on the examination of 20 branch tips at each sampling point, is shown in the following table:

District	Number of sampling points		Highest percentage of buds infested	
	Black spruce	White spruce	Black spruce	White spruce
Fort Frances	4	2	3	5
Kenora	8	3	6	4
Sioux Lookout	12	0	12	—
Geraldton	4	2	2	2
Port Arthur	6	2	4	1
Swastika	3	0	8	—
Cochrane	6	0	3	—
Kapuskasing	0	5	—	16
Sault Ste. Marie	0	4	—	8
White River	2	2	3	1
Sudbury	0	4	—	15
Gogama	2	0	7	—
Chapleau	3	1	3	1
North Bay	4	1	8	7
Parry Sound	0	4	—	6
Tweed	0	2	—	2
Lindsay	0	2	—	6

Ninety per cent of the buds on several ornamental white spruce trees in the town of Nipigon, Port Arthur District, were killed by the midge.

White-pine Shoot Borer, *Eucosma gloriola* Heinr.—This borer has been particularly troublesome, attacking the lateral branches of Scots and white pine in southern Ontario and the leaders of jack pine reproduction in northern Ontario. In 1961, heavy infestations occurred in a white pine plantation in Brighton Township in the Lindsay District. High populations were reported in several Scots pine plantations in Norfolk County, Lake Erie District, and in

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Armour and Chaffey townships, Parry Sound District. Noteworthy damage to jack pine regeneration occurred at one location in Township 119 in the Sudbury District where 22 per cent of the terminals were infested.

A Pine Tip Moth, *Rhyacionia buscknna* Heinr.—Since 1959, small numbers of this insect have been found burrowing in the new shoots of jack pine in 12 of the 14 forest districts north of Lake Nipissing.

Aspen Blotch Miner, *Lithocolletis salicifoliella* Chamb.—There was little change in the status of this insect in eastern Ontario in 1961. Pockets of heavy infestation persisted on small open-growing and understory trees, especially in the Central Region. Population levels increased in western Ontario and severe browning of trembling aspen foliage occurred locally from the Port Arthur District to the Manitoba boundary.

Maple Leaf Cutter, *Paraclemensia acerifoliella* (Fitch)—Heavy infestations of this insect persisted on hard maple for the third consecutive year in the Southeastern Region. Defoliation was moderate to severe in a band extending from Elzevir and Hungerford townships in Hastings County eastward through Lennox, Addington, and Frontenac counties, to Dalhousie and North Burgess townships in Lanark County. Light defoliation in maple woodlots was reported in many other townships of the region.

Larch Casebearer, *Coleophora laricella* (Hbn.)—A number of collections added to our knowledge of the northern limit of the distribution of this species and its principal parasite, *Agathis pumila* (Ratz.). The first record of larch casebearer in the Fort Frances District was established in 1961 by a collection from Morley Township, and several collections were received from the districts of Geraldton, Cochrane, and White River, where it had previously been found only once. The introduced parasite *A. pumila* was reared from collections made in northern areas as follows: two specimens from each of Kakabeka Falls and Fort William in the Port Arthur District and four specimens from Wawa in the White River District. The Kakabeka recovery represents a spread of more than 400 miles from the closest release point on the Upper Peninsula of Michigan in 1951.

In general, there was little change in the abundance of the casebearer throughout the Province. However, substantial increases did occur at several locations in southern Ontario and in the Port Arthur District as shown in the following summary.

Location		Average number of larvae per branch sample	
District	Township	1960	1961
Lake Erie	Bosanquet	10.0	26.6
Lake Huron	Glenelg	8.2	37.5
Parry Sound	Ridout	6.8	15.4
Port Arthur	Paipoonge	5.6	13.7

Pine Tortoise Scale, *Toumeyella numismaticum* (P. & M.)—Small pockets of heavy infestation on jack and Scots pine were more common than in any year since the outbreak of 1955-56. Infestations were located in eleven townships as follows: Malahide Township, Lake Erie District; Chaffey Township, Parry Sound District; Widdifield, Bastedo, Caldwell, and Ratter townships, North Bay District; Chapleau and Halsey townships, Chapleau District; townships 2F and 4E, Sault Ste. Marie District; and Burris Township, Fort Frances District.

Small European Elm Bark Beetle, *Scolytus multistriatus* (Marsh.)—The only change in the known distribution of this introduced vector of the Dutch elm disease in southwestern Ontario was in the Lake Huron District. The bark beetle was found as far north as Elderslie and Amabel townships in Bruce County, and Osprey Township in Grey County. It had previously been recorded throughout Lake Erie District, as far north as Paisley in the Lake Huron District, and along the north shore of Lake Ontario in the districts of Lake Simcoe and Lindsay.

Pine Needle-sheath Miner, *Zelleria haimbachi* Busck—This insect has been collected from jack pine in Ontario for a number of years. However, damage was of little consequence until 1961 when numbers increased and damage to the new foliage of some open-grown trees was severe. Pockets of heavy infestation occurred in the Kirkwood Management Unit, Sault Ste. Marie District; Nairn Township and on Cloche Island, Sudbury District; and Bayham Township, Lake Erie District. Moderate damage was common in the Lake Simcoe District.

Pitch Nodule Maker, *Petrova albicapitana* (Busck)—Pitch nodules made by this insect have been frequently found on jack and Scots pine trees throughout the Province, but the damage has been of little consequence. In 1961, an unusually high incidence of attack was reported on two jack pine shelterbelts in East Gwillimbury and Whitchurch townships in the Lake Simcoe District, where numbers of second-year nodules per 18-inch branch tip averaged 6.5 and 2.8, respectively.

Pine Spittlebug, *Aphrophora parallela* (Say)—Pockets of medium to heavy infestation occurred on widely-separated plantings of white and Scots pine in the Southwestern Region, and on jack pine reproduction in the Mississagi River area east of Sault Ste. Marie.

Walkingstick, *Diapheromera femorata* (Say)—Heavy infestations were common in the Lindsay District where no appreciable defoliation by this insect had been reported for five years. The insects were found mainly on oaks, with infestations common in the Durham and Ganaraska forests, and in a narrow band extending through parts of Hamilton, Haldimand, and Cramahe townships in Northumberland County. The only other infestations reported were in the Cape Croker area of the Lake Huron District, where defoliation was generally light with occasional basswood trees showing moderate defoliation.

OTHER NOTEWORTHY INSECTS

Insect	Host	Locality	Remarks
Altica ulmi Woods	Elm, white	Prince Edward and Hastings counties	Heavy infestations.
Archips cerasivoranus (Fitch)	Cherry, willow, etc.	Most districts	Pockets of heavy infestation.
Cecidomyia reeksi Vock	Pine, jack	Lake Simcoe, North Bay, and Swastika districts	Considerable twig mortality.
Contarinia sp.	Pine, red	Sudbury and Sault Ste. Marie districts	Two pockets of severe needle cast.
Corthylus punctatissimus (Zimm.)	Maple, sugar	Lake Simcoe and Lake Huron districts	Reproduction heavily infested in numerous woodlots.
Corythucha spp.	Elm, Oak, Cherry, etc.	Lindsay and Tweed districts	Pockets of heavy infestation.
Dasyneura balsamicola (Lint.)	Fir, balsam	Central and South-central regions	High populations persisted.
Datana ministra (Drury)	Elm, white	Essex and Kent counties	Light to severe defoliation on roadside trees.
Epinotia nanana Treit. and *Eucordylea piceaella* Kft.	Spruce, white and Norway	Lake Simcoe and Lake Huron districts	Moderate to severe mining by combined infestations.

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OTHER NOTEWORTHY INSECTS—continued

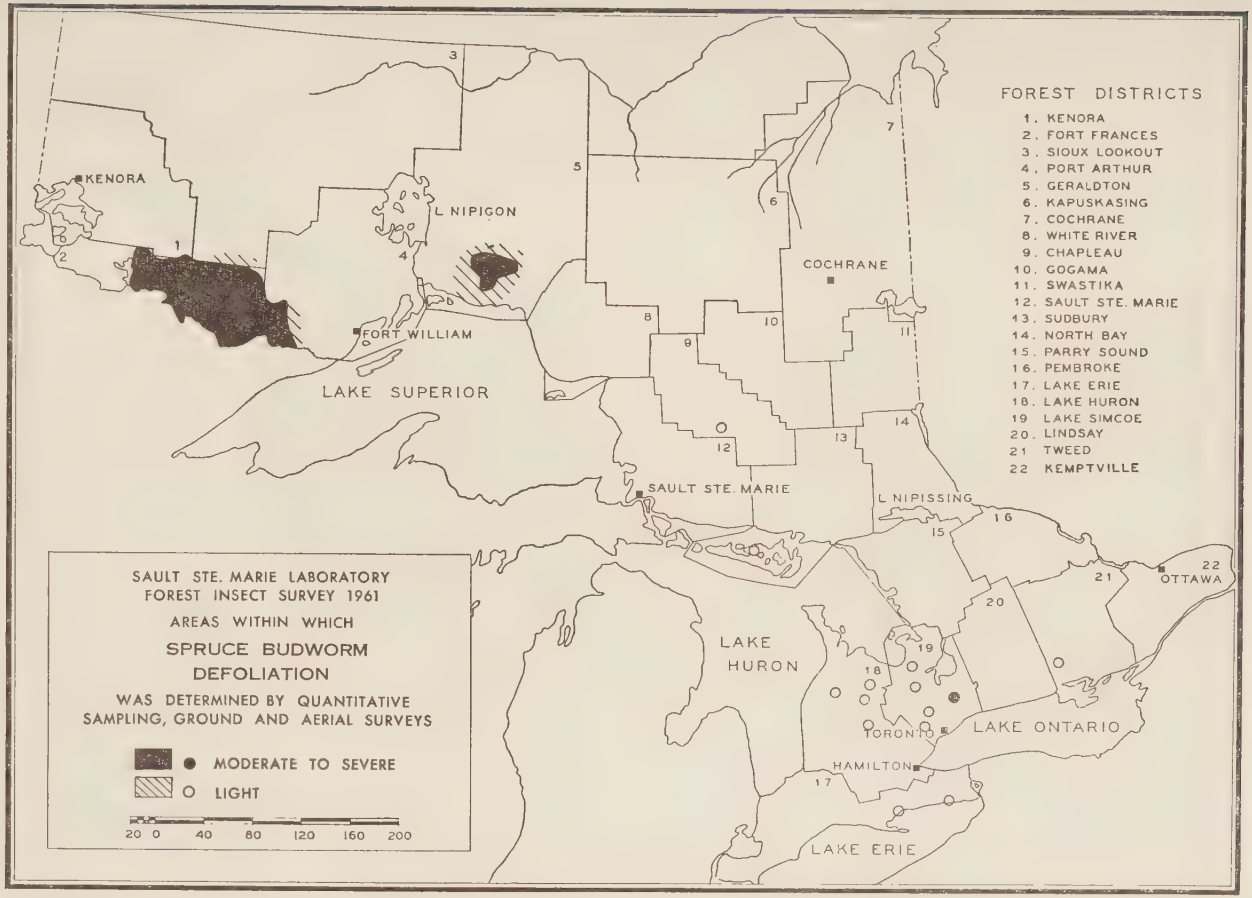
Insect	Host	Locality	Remarks
Exoteleia dodecella Linn.....	Pine, Scots	Southern Ontario	Increased numbers of heavy infestations.
Exoteleia pinifoliella (Cham.)..	Pine, jack	Southwestern Region, Lindsay, and Parry Sound districts.	Increased numbers of medium to heavy infestations.
Fenusa dohrnii (Tischb.).....	Alder, speckled and black	Lake Erie, White River, and Sudbury districts	Pockets of heavy infestation.
Fenusa pusilla (Lep.).....	Birch, white	Southern Ontario, North Bay, and Sudbury districts	Numerous pockets of light to heavy infestation.
Fenusa ulmi Sund.....	Elm, white, and slippery	Lindsay, Lake Simcoe, and Lake Erie districts	Small groups of trees heavily infested.
Galerucella luteola (Müller)	Elm	St. Thomas and near Windsor	Medium and heavy infestations.
Gonioctena americana (Schiffr.)	Aspen, trembling	Southern Ontario	Pockets of heavy infestation on reproduction.
Nepticula sp.....	Birch, white	Lake Huron District	Heavy infestations reduced due to competition with *Bucculatrix canadensisella.*
Pareophora minuta (MacG.)...	Ash, black	Chapleau and Gogama districts	Heavy infestations.
Pikonema alaskensis (Roh.)....	Spruce	Most districts	Numerous small pockets of heavy infestation.
Rheumaptera hastata Linn.....	Birch, white	Around Beardmore, Geraldton District	Medium infestations over approximately 100 square miles.
Rhyacionia adana Heinr.....	Pine, red	Lake Simcoe and Sault Ste. Marie districts	Severe damage in two young plantings.
Sparganothis sulfureana Clem..	Pine, red and Scots	Sault Ste. Marie District	Heavy infestations in three young plantings.
Trisetacus pini (Nal.).....	Pine, white	Sault Ste. Marie, North Bay, and Lake Simcoe districts	First records for Ontario.

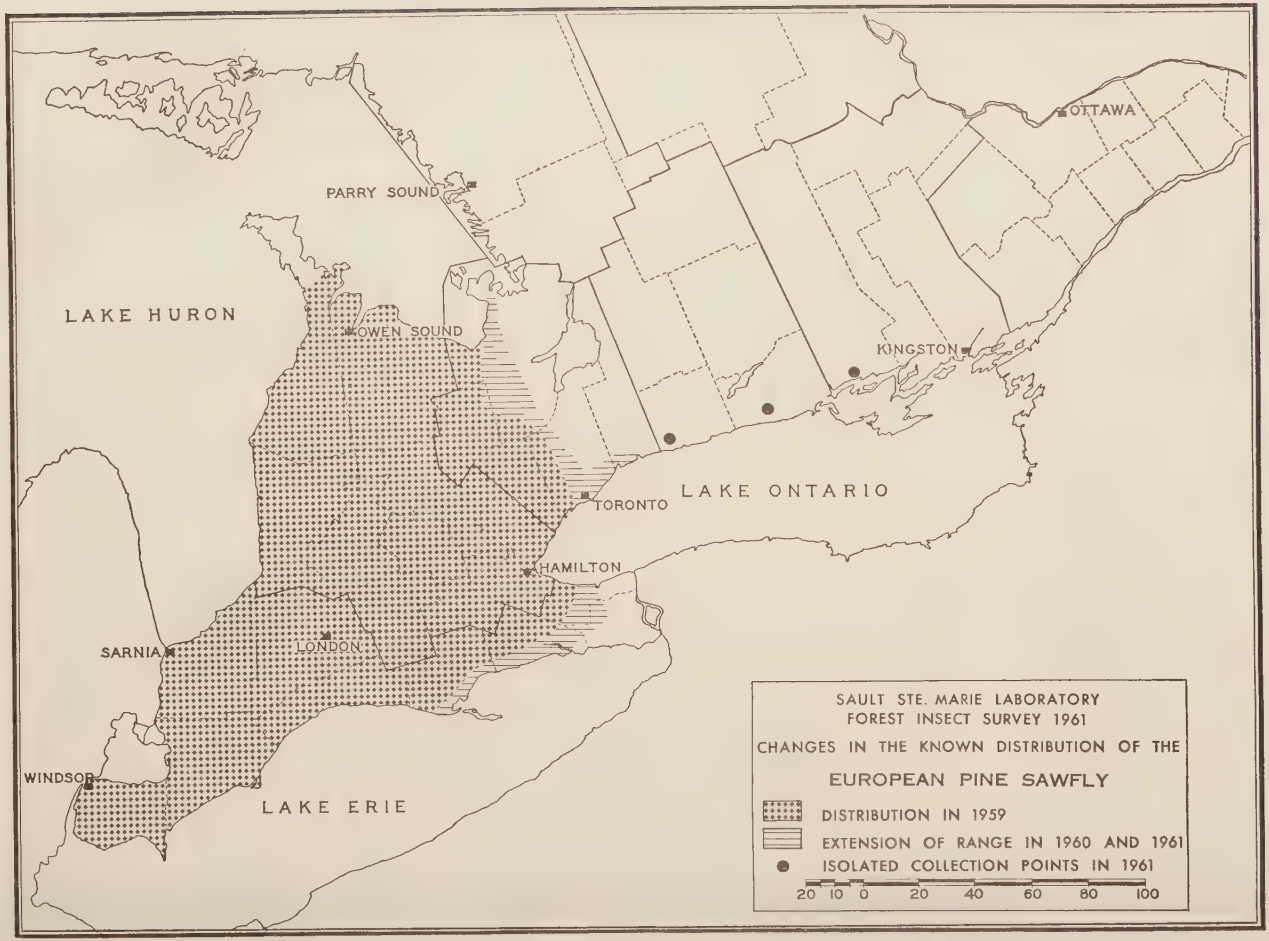
Insect Species	Number of collections by forest regions and districts*																					
	Western			Mid-western		Northern			Central					South-central			South-western			South-eastern		
	Sioux Lookout	Kenora	Fort Frances	Geraldton	Port Arthur	Kapuskasing	Cochrane	Swastika	White River	Sault Ste. Marie	Chapleau	Gogama	Sudbury	North Bay	Parry Sound	Pembroke	Lake Simcoe	Lake Huron	Lake Erie	Lindsay	Tweed	Kemptville
Acleris variana	10	11	2	45	13	9	20	7	44	19	28	17	14	7	9	5	2	5	0	2	9	2
Alsophila pometaria		0	0														5	7	24	5	2	0
Anisota senatoria																		2	3	1	4	
Aphrophora parallela	1	0	0	11	5	4	10	4	10	5	13	9	1	2	1	2	4	4	2	1	2	3
Argyrotoxa semipurpurana									1	9			1				1		1			
Bucculatrix canadensisella	0	0	0	2	1	0	0	0	3	3	2	0	14	4	11	21	4	25	1	9	5	0
Choristoneura fumiferana	14	4	15	52	34	11	5	2	11	11	10	2	9	3	0	0	16	10	9	2	4	3
Choristoneura pinus	3	7	4	2	4	0	5	0	1	1	2	1	4	0	0	1	6	6	18	0	1	
Coleophora laricella	1		2	6	8		1		8	7			5	6	9	10	10	13	7	8	14	6
Datana integerrima																		13	3			
Dendroctonus simplex		1	0			1	12	3		0		1							1			
Diapheromera femorata																	0	1	3	1	0	
Diprion hercyniae	0	3	14	0	6	3	18	4	1	17	0	7	15	14	29	20	19	12	8	17	25	19
Diprion similis																	14	13	5			
Enargia decolor	1	3	1	10	2	15	1	1	15	20	15	20	18	15	1	3	0	0	1	0	0	0
Epinotia solandriana	5	2	0	18	7	5	2	3	19	14	33	5	3	9	3	0	2	3	0	1	4	3
Erannis tiliaria	0			0	0					7			3	2	8	5	16	13	16	32	24	20
Eucosma gloriola	1		1		0					2			2	0	5	3	3	9	1	1	0	0
Hylobius radicis										0					0	2	2					
Hyphantria cunea	0	8	4	0	7	1	0	2	0	3	4	7	5	6	15	14	8	32	12	7	12	22
Lithocolletis salicifoliella	11	7	27	16	9	3	17	6	35	1	28	8	9	6	2	1	0	0	1	0	0	1
Malacosoma americanum										9			15	5	16	11	14	22	8	9	13	13
Malacosoma disstria	14	18	7	0	0	0	0	0	0	1	0	0	12	1	8	3	3	3	0	9	3	1
Malacosoma pluviale	2	8	2	19	14	0	7	7	23	3	21	18	6	2								
Nematus sp.	1	1	1	0	0	0	4	1	4	1	2	2	3	2	5	18	2	1	0	0	8	9
Neodiprion abietis complex	1	8	8	8	2	3	9	3	11	11	3	4	9	6	4	2	2	7	0	14	4	0
Neodiprion lecontei										2			1	0	5		7	2		20	3	7
Neodiprion nanulus nanulus	3	8	11	1	5	1	5	1	6	0	4	1	5	13	3	8	1	0		1	5	1

SUMMARY OF COLLECTIONS OF IMPORTANT AND NOTEWORTHY INSECTS—Concluded

Insect Species	Number of collections by forest regions and districts*																					
	Western			Mid-western		Northern			Central					South-central			South-western			South-eastern		
	Sioux Lookout	Kenora	Fort Frances	Geraldton	Port Arthur	Kapuskasing	Cochrane	Swastika	White River	Sault Ste. Marie	Chapleau	Gogama	Sudbury	North Bay	Parry Sound	Pembroke	Lake Simcoe	Lake Huron	Lake Erie	Lindsay	Tweed	Kemptville
+*Neodiprion pratti banksianae*	1	2	8		2		6		1				4	3	9		1	2		1		
+*Neodiprion pratti paradoxicus*										1						7					7	3
Neodiprion sertifer																	28	40	31	6	2	
Neodiprion swainei	0	0	0					5		0	0	7	10	8	0							
Neodiprion virginianus complex	11	0	16	12	17	12	11	4	32	0	6	7	10	4	2		1	0		0		0
Paleacrita vernata																	3	7	2	0	0	0
Paraclemensia acerifoliella										1	1					0	0	0	1	0	8	11
Petrova albicapitana	2	4	8	17	7	8	13	11	29	0	4	13	6	8	4	2	5	0	0	2	2	4
Pissodes approximatus		0	0	1	0		1		1		0		1	0	2	0	1	2	1	0	0	0
Pissodes strobi	3	4	4	7	4	5	12	5	18	17	10	1	9	5	5	8	11	8	0	5	13	12
Pleroneura borealis	0	0	0	0	0	0	0	0	0	0	0	1	1	0	0	0	0	0		0	0	0
Pristiphora erichsonii	3	3	10	31	12	10	20	21	24	15	16	7	10	3	15	16	19	14	10	19	13	9
Pristiphora geniculata						1		7	0	19	2	4	14	7	10	5	5	12	3	9	1	0
Profenusa thomsoni		1	4	2	1	13	24	22	19	14	14	12	17	6	2	1		4	0	0	0	0
Rhabdophaga swainei	18	12	8	22	25	7	15	10	16	8	13	7	13	12	8	1	4	1		9	4	1
Rhyacionia buoliana										0					0		14	1	7	5	2	
Rhyacionia buskana	10	1	1		8	0	4	0	0	0	2		8	3			1	2	0	0		
Scolytus multristriatus																	0		1			0
Toumeyella mumismaticum	0	2	5		4		0			1	3		1	6	4		3	3	1			2
+*Zeiraphera* sp.on spruce	2	2		15	8	4	9	3	6	9	2		8	3	2				1		1	
+*Zeiraphera fortunana*			2	3	3					4	1			1	5					1		2
Zeiraphera ratzeburgiana		1		5	17		2	1	3	8	2	3	10	8	5		2	1		4	3	4
Zelleria haimbachi	2	0	2		0		2			5	1		4	4	1		2	1	3	2	5	1

*A zero entry denotes nil collections in 1961; a blank indicates no records in recent years; and + marks species identified with certainty for the first time in 1961.


FOREST DISTRICTS
1. KENORA
2. FORT FRANCES
3. SIOUX LOOKOUT
4. PORT ARTHUR
5. GERALDTON
6. KAPUSKASING
7. COCHRANE
8. WHITE RIVER
9. CHAPLEAU
10. GOGAMA
11. SWASTIKA
12. SAULT STE. MARIE
13. SUDBURY
14. NORTH BAY
15. PARRY SOUND
16. PEMBROKE
17. LAKE ERIE
18. LAKE HURON
19 LAKE SIMCOE
20. LINDSAY
21 TWEED
22 KEMPTVILLE
KENORA
L NIPIGON
FORT WILLIAM
LAKE SUPERIOR
COCHRANE
SAULT STE. MARIE
L NIPISSING
OTTAWA
LAKE HURON
TORONTO
LAKE ONTARIO
HAMILTON
LAKE ERIE
SAULT STE. MARIE LABORATORY
FOREST INSECT SURVEY 1961
AREAS WITHIN WHICH
SPRUCE BUDWORM
DEFOLIATION
WAS DETERMINED BY QUANTITATIVE
SAMPLING, GROUND AND AERIAL SURVEYS
MODERATE TO SEVERE
LIGHT
20 0 40 80 120 160 200


OTTAWA
PARRY SOUND
LAKE HURON
OWEN SOUND
KINGSTON
LAKE ONTARIO
TORONTO
HAMILTON
SARNIA
LONDON
WINDSOR
LAKE ERIE
SAULT STE. MARIE LABORATORY
FOREST INSECT SURVEY 1961
CHANGES IN THE KNOWN DISTRIBUTION OF THE
EUROPEAN PINE SAWFLY
DISTRIBUTION IN 1959
EXTENSION OF RANGE IN 1960 AND 1961
ISOLATED COLLECTION POINTS IN 1961
20 10 0 20 40 60 80 100

PROVINCE OF ONTARIO

FOREST DISEASE SURVEY

H. D. Griffin and D. F. Lynn

Forest Pathology Laboratory, Maple, Ontario

INTRODUCTION

The damage caused by forest tree diseases in Ontario was generally more severe during 1961 than in the two preceding years. Throughout much of the Province, particularly the southwest, the snowfall was far below normal. This resulted in the winter-killing of broad-leaved trees and shrubs, and the excessive drying of conifers. In the northwestern section of the Province prolonged and exceptionally severe drought conditions persisted throughout the summer causing foliage injury to many coniferous species.

A total of 3,129 collections was received during the 1961 season and they were distributed by tree species as follows:

Coniferous Trees	Collections
Balsam fir	277
Jack pine	257
White pine	192
Black spruce	62
Red pine	48
White spruce	45
Juniper	19
Tamarack	14
Scots pine	13
Cedar	7
Hemlock	3
Others	12
Total	949

Broad-leaved Trees	Collections
Maple	509
Poplar	475
Alder	208
Birch	153
Elm	151
Willow	91
Mountain ash	79
Oak	52
Amelanchier	32
Basswood	25
Ash	23
Hazel	23
Beech	23
Dogwood	21
Elder	15
Hawthorn	15
Sumac	8
Others	147
Total	2,069

Miscellaneous hosts 111

Grand Total 3,129

IMPORTANT DISEASES

Dutch Elm Disease—To date, *Ceratocystis ulmi* (Buism.) C. Moreau, the causal organism of Dutch elm disease, was isolated from 97 of 169 samples.

The organism has been found for the first time in Bruce, Grey, and Dufferin counties.

Balsam Fir Mortality—In August, 1959, foresters of the Spruce Falls Power and Paper Company Limited, first noted many dead balsam fir trees scattered throughout the mixed wood forests in Guilfoyle Township, Kapuskasing District. Subsequently it was estimated that 5—10 per cent of the balsam component of the stand consisted of dead and dying trees. Dead twigs and branches were the initial injury symptoms and this was followed by a general chlorosis of the entire crown which then rapidly turned red.

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In 1960 a small permanent sample plot was established in the area with a view to determining the trend towards injury, mortality, and recovery.

Plot studies together with aerial surveys, indicated that a serious problem existed in this area. In 1961 six additional sample plots containing 442 balsam fir trees were established.

The trees were classified as to the nature and extent of damage, and other factors such as site, aspect, and drainage, were recorded.

Systematic sampling of trees revealed the presence of the following fungi: *Thyronectria balsamea* (Cke. & Pk.) Seel., *Dermea balsamea* (Pk.) Seav., *Valsa abietis* Fr., *Valsa* spp., *Cytospora* spp., *Armillaria mellea* (Vahl. ex Fr.) Quél., *Ascocalyx abietis* Naumov, and *Tympanis* spp. While some of these fungi are known to be important in balsam fir dieback in Ontario, this problem is sufficiently different from that encountered previously to warrant caution in postulating the role these organisms play in the disease syndrome.

At present no conclusive evidence is available which would permit an accurate assessment of the cause of this mortality. There are some indications that part of the problem may be the result of prolonged stand break-up following the budworm attack of 1947-49. A second contributing factor may have been the prolonged drought of 1955 combined with the less severe drought of 1959. The condition is spreading outward from the originally affected area and somewhat more intensive investigations are planned for 1962.

Maple Dieback—Once again no changes were recorded in the boundaries of the affected areas in 1961. The general impression gained from the 1960 field observations was that a definite recovery was made by some trees on the sample plots and this recovery was irrespective of tree species. Further, the general chlorotic condition in evidence during the early part of the season diminished as the summer progressed; however, the fall-type coloration increased in intensity.

It is becoming increasingly apparent that dieback is a problem affecting all deciduous tree species, rather than maple alone, although there has been a general improvement of the condition during 1960.

To date no primary fungous pathogens or insects[1] have been found which could be held suspect as the triggering factors of this condition; and, as a consequence, no detailed explanation can be offered at this time.

Leaf and Twig Blight of Poplar—Once again this condition was found to be more extensive in 1961 than in previous years. *Pollaccia radiosa* (Lib.) Bald. & Cif. was found on trembling aspen from Fort Frances, Sault Ste. Marie, Port Arthur, Geraldton, White River, Gogama, Swastika, Sudbury, Pembroke, Lake Huron, Lake Simcoe, and Lindsay districts. *Pollaccia elegans* Serv. was found on collections of balsam poplar from the Pembroke, North Bay, Geraldton, Sioux Lookout, and Port Arthur districts.

Rusts of Conifers—Witches'-brooms of spruce caused by *Melampsorella caryophyllacearum* Schroet. were found in the Geraldton, White River, Sault Ste. Marie, and Port Arthur districts. The conspicuous brooms on the host distinguish this rust from *Chrysomyxa* spp. which also infect spruce.

Rusts caused by *Chrysomyxa ledicola* Lagerh. and *Chrysomyxa ledi* de Bary, were general throughout the range of white and black spruce in northern Ontario.

Rust damage to balsam fir was generally light throughout its entire range.

The incidence of *Coleosporium asterum* (Diet.) Syd. was high on jack and red pine in the Lake Huron, Lake Erie, Lake Simcoe, Tweed, Pembroke, and Parry Sound districts.

[1] This information kindly supplied by Dr. W. L. Sippell, Forest Insect Laboratory, Sault Ste. Marie, Ont.

Nectria Canker of Poplar—In the Long Lac area, a high incidence of a stem canker, apparently resulting from infection by a species of *Nectria* was observed on trees of most age classes. Smaller trees may be killed, but on the larger trees the canker can apparently persist for many years.

At present there is some doubt as to the *Nectria* sp. involved. There is a strong indication that it may be an undescribed taxon.

Ink Spot Disease of Aspen Poplar—*Ciborinia whetzelii* (Seav.) Seav., the causal agent of this disease, was found generally distributed throughout Ontario. Once again, in contrast to 1960, there was an increased number of reports of small trees being killed as a result of this disease. Leaves on both small and large trees were killed early in the summer and remained on the trees until fall, resulting in the characteristic scorched appearance of affected trees during the growing season.

Basal Stem Rust of Jack Pine—Examination of many jack pine stands in Ontario revealed the presence of a basal canker resulting from infection by a species of *Cronartium*. At present the actual identity of the causal organism is in doubt, but its effects on the host are quite severe. Elongated cankers are induced on the butt and these result in a slower growth rate and weakening of the host. In some stands as many as from 15 to 50 per cent of the trees are affected with this condition.

White Pine Blister Rust—In accordance with the expressed desire of the Ontario Department of Lands and Forests for additional information on blister rust conditions in important pine growing areas throughout the Province, a training program in reconnaissance was carried out in a new management unit in Raglan Township, Pembroke District. Five rangers, two staff members of the Maple Laboratory, and Dr. W. R. Haddow of the Ontario Department of Lands and Forests, took part in this program.

While the results of this survey are not yet available, the program clearly indicates the feasibility of employing ranger personnel in this type of program.

Surveys of blister rust in other areas of the Province indicate an increasing mortality of white pine in the southern part of the Port Arthur District. Increased incidence of the disease was observed in the Chapleau, Gogama, and Swastika districts.

Red Pine Mortality—Early in 1954, the first report of a red pine mortality problem in the Kirkwood Management Unit was made by the Forest Biology Ranger of the Sault Ste Marie District.

Red pine in the Kirkwood area often show a yellowing of one or more branches, with those of the lower crown being the most susceptible. The needles then turn brown, indicating death of the affected branch.

Examination of these trees usually reveals the presence of cankers confined to the lower internodes of the stem, particularly above the first basal internode. A second cankered area is often found on the dead branches, and this appears to be associated with damage by several species of insects.

In other regions of the Province, branch mortality associated with cankering, has been detected on plantation-grown red pine, but in only one other area has basal cankering similar to that noted at Kirkwood been observed.

At present no satisfactory explanation can be offered for the cause of this condition, however, this problem is the subject of intensive research by officers of the Forest Insect Laboratory, Sault Ste. Marie, and the Forest Pathology Laboratory, Maple.

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Host	Organism	Locality	Remarks
Ash, black.....	*Phoma infessa* Ell. & Ev.	Greenock Township, Lake Huron District	Associated with canker and dieback.
Ash, red.....	*Phoma infessa* Ell. & Ev.	Charlotteville Township, Lake Erie District	Associated with canker and dieback.
Ash, white.....	*Phoma infessa* Ell. & Ev.	Vespra–Lake Simcoe District; Crowland townships, Lake Erie District; North Elmsby Township, Kentville District; Freeman Township, Parry Sound District.	Associated with canker and dieback.
Catalpa, northern....	*Alternaria catalpae* (Ell. & Martin) J. B. Parker	Yarmouth township, Lake Erie District	First herbarium record. Leaf spot (secondary?)
Cedar, eastern red....	*Gymnosporangium clavipes* (Cke. & Peck) Cke. & Peck	Charlotteville, Baham, and Aldborough townships, Lake Erie District.	Gall rust.
Cedar, eastern red...	*Gymnosporangium juniperi-virginianae* Schw.	Charlotteville Township, Lake Erie District, Waterloo and Sullivan townships, Lake Huron District; Sophiasburg Township, Tweed District.	Gall rust.
Chestnut, American..	*Endothia parasitica* (Murr.) P. J. & H. W. Anderson	Bayham and Malahide townships, Lake Erie District.	Blight, canker.
Elm, Chinese.....	*Nectria cinnabarina* Tode ex Fr.	Waters Township, Sudbury District; Rolph Township, Pembroke District	Coral spot: causes canker and dieback.
Elm, white.....	*Gnomonia ulmea* (Sch. ex Fr.) Thuem.	Various townships in the Lake Huron, Lake Erie, Lake Simcoe, North Bay, Parry Sound, Tweed, and Kentville Districts.	Black leaf spot of elm.
Maple, mountain.....	*Ophiocordyceps clavulata*	Guilfoyle Township, Kapuskasing District.	Parasitizing *Lecanium* spp. (scale insects) on mountain maple.
Maple, Norway.....	*Fusarium solani* (Mart.) Appel & Wr.	Chatham Township, Lake Erie District.	Basal canker (secondary?).
Oak, red.....	*Cryptodiaporthe densissima* (Ell.) Wehm.	Thessalon and Jocelyn townships, Sault Ste. Marie, District; Beauage Township, North Bay District; Mulmur Township, Lake Simcoe District.	Associated with cankering and killing of small branches.
Oak, white.....	*Cryptodiaporthe densissima* (Ell.) Wehm.	Glenelg township, Lake Huron District.	Associated with cankering and killing of small branches.
Pine, jack.....	*Armillaria mella* (Vahl ex Fr.) Quél.	Various townships in the Geraldton, Chapleau, and White River Districts.	Root rot, collar resinosis.
Pine, jack.....	*Hypodermella ampla* (J. J. Davis) Dearn.	General throughout the range of jack pine in Ontario.	Tar spot, needle cast.
Poplar, Lombardy...	*Dothichiza populea* Sacc. & Briard	Walpole Township, Lake Erie District; Bruce Co., Lake Huron District; Camden Township, Tweed District.	Branch and trunk canker.
Spruce, black.....	*Bifusella crepidiformis* Darker	Chester Township, Sudbury District; Cairngorm Lake and Township 82, Geraldton District.	Weak parasite on needles(?). Diseased needles remain on tree for several years.

PROVINCES OF MANITOBA AND SASKATCHEWAN

FOREST INSECT SURVEY

K. R. Elliott and V. Hildahl

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INTRODUCTION

Prolonged hot, dry weather in Manitoba and Saskatchewan in 1961 produced the most severe drought conditions since the early 1930's. In agricultural areas this was accompanied by impressive increases in the abundance and damage of a number of crop pests, notably grasshoppers, and resulted in severe drought damage to some ornamental and shelterbelt plantings. Hot, dry weather favoured increased damage by the spruce spider mite but no other effects have yet been detected in terms of forest insects. Forest fire hazard was extremely high, and damage was the worst on record in Manitoba. This seriously affected insect surveys by limiting the availability of aircraft, and by preventing aerial observations during prolonged periods of heavy smoke haze.

The most serious defoliators continued to be the spruce budworm, larch sawfly, forest tent caterpillar, and balsam-fir sawfly. The spruce budworm continued to cause moderate to severe defoliation in three main areas with moderate increases in the size of infestations. Populations of the larch sawfly increased in the Western District of Manitoba, continued at a high level in the Prince Albert District of Saskatchewan, but declined in all other areas. The predicted general outbreak of the forest tent caterpillar materialized in 1961 with numerous new infestations and substantial increases in the size of the 1960 infestations. A further decline in numbers of tent caterpillars was evident in the old infestation in the Cypress Hills area. The balsam-fir sawfly outbreak continued for the second consecutive year with moderate increases in the areas affected, but with a slight, general decrease in the severity of attack. A tube-making Tortricid occurred in outbreak numbers for the first time and caused severe defoliation of jack pine in the Nisbet Provincial Forest in Saskatchewan.

The number of samples received at the Laboratory totalled 3,794 and were distributed among the principal host trees as follows:

Coniferous Trees	Collections	Broad-leaved Trees	Collections
White spruce	461	Trembling aspen	1,217
Black spruce	168	Balsam poplar	165
Tamarack	275	Willow	297
Balsam fir	118	Birch	155
Jack pine	407	Alder	98
Scots pine	4	Eastern chokecherry	142
Lodgepole pine	3	Manitoba maple	76
Miscellaneous pines	6	Elm	33
Miscellaneous conifers	6	Bur oak	28
		Dogwood	26
Total	1,448	Ash	13
Miscellaneous hosts or hosts unspecified	75	Pincherry	10
		Misc. Broad-leaved trees	11
		Total	2,271
		Grand Total	3,794

Spruce Budworm, *Choristoneura fumiferana* (Clem.)—Only slight increases occurred in the extent of areas under heavy attack by this insect, but a general increase was noted in the frequency with which larvae were found in other areas. This general distribution is indicated on the accompanying map, together with the large infestation area at Namew Lake and smaller infestations in the Riding Mountain National Park and Cypress Hills Provincial Forest. Also shown are spot infestations near Pine Dock and on Hecla Island in the Interlake area of Manitoba, and in an abandoned white spruce shelterbelt near Rosthern in central Saskatchewan.

The Namew Lake infestation on the Manitoba-Saskatchewan boundary south of Flin Flon extended slightly to the north and east to increase the area of moderate to severe defoliation from about 900 to 950 square miles. Although losses have been reduced by salvage cutting in the central parts of the area where defoliation commenced about 1952, host mortality is well advanced there, and the incidence of leader- and top-killing is high in most other parts. Very severe defoliation in 1961 was due to increased budworm populations that mined and killed a large proportion of the buds before growth commenced.

Little conspicuous defoliation occurred in the northern part of Riding Mountain National Park, indicating a reduction in numbers in that area. The infestation on the eastern escarpment of the Park (discovered in 1960) increased slightly in area and intensity. Defoliation of current shoots, ranging from light to 80 per cent on white spruce and up to 100 per cent on balsam fir, affected an area of some 12 square miles.

The area of severe defoliation of white spruce in the West Block of the Cypress Hills Provincial Forest in southwestern Saskatchewan increased from about 100 to 600 acres, and light to moderate defoliation affected some 2,500 acres with westward extension into Alberta for the first time. Although some salvage cutting has been carried out in this area, the infestation does not appear to be as severe as infestations that occur in spruce-balsam stands.

The status of infestations previously reported along the Birch River in Saskatchewan and at Setting and Red Sucker lakes in northern Manitoba could not be determined because of interference with aerial survey schedules by the forest fire situation.

The following table summarizes the frequency of occurrence of spruce budworm larvae from white spruce and balsam fir for the past three years.

District	Number of collections from white spruce and balsam fir	Percentage of collections containing spruce budworms		
		1959	1960	1961
Manitoba:				
Southern	36	8	7	17
Eastern	141	25	24	20
Northern	65	30	30	55
Western	92	10	14	22
Saskatchewan:				
Hudson Bay	72	19	0	10
Prince Albert	54	0	5	5
Meadow Lake	62	0	2	0
Northern	19	4	5	47
Southern	18	18	30	22
West-Central	17	0	0	6

Intensified egg-mass sampling was carried out at representative points in the main infestation areas at NamewLake, Riding Mountain National Park and Cypress Hills. This indicates that the intensity of attack will probably increase in 1962 in areas where only light to moderate attack occurred in 1961. There

are indications that the Cypress Hills infestation will increase in area, but similar data for the other two infestations were not available. The results of the sampling are summarized in the following table.

Infestation Area	Number of sample points (in brackets) and the defoliation forecast for 1962 at those points where current defoliation in 1961 was:		
	Nil	light to moderate	severe
Namew Lake (Man.–Sask. border)	(0) —	(5) M—S	(31) S
Riding Mtn. Nat'l Park (Manitoba)	(0) —	(8) M—S	(2) S
Cypress Hills (Saskatchewan)	(4) L—M	(10) M—S	(3) M—S

L—Light (1-29%); M—moderate (30-69%); S—severe (70–100%).

Jack-pine Budworm, *Choristoneura pinus* Free.—This defoliator caused noticeable damage in only two areas in Manitoba and one in Saskatchewan. Defoliation declined from severe to light in the Belair Forest Reserve at the southeastern end of Lake Winnipeg. North of Arborg in the Interlake area, moderate to severe defoliation within some 20 square miles persisted for the second consecutive year. Light defoliation developed for the first time in recent years at several scattered locations within the Nisbet Provincial Forest in Saskatchewan. Populations remained at very low levels throughout all other areas where this insect has occurred in infestation numbers in the past.

The following table shows the frequency of occurrence of the budworm in larval collections during the past three years.

District	Number of collections from jack, lodgepole and Scots pine	Percentage of collections containing jack-pine budworm		
		1959	1960	1961
Manitoba:				
Southern	80	36	10	23
Eastern	67	15	15	15
Northern	46	0	0	9
Western	11	5	0	9
Saskatchewan:				
Hudson Bay	22	0	0	5
Prince Albert	102	4	9	10
Meadow Lake	50	0	0	2
Northern	17	0	0	0
Southern	1	7	0	0
West-Central	3	0	0	0

A Pine Tube Moth, *Argyrotaenia* sp., probably *tabulana* Free.—Infestations of a tube-maker have occurred sporadically in the past on various species of pines in Canadian forests. The first instance of an infestation in the Prairie Provinces of Manitoba and Saskatchewan was recorded in 1961 in the Home Block of the Nisbet Provincial Forest near Prince Albert, Saskatchewan. Commencing in late July, needle damage became progressively more widespread and severe until late in September when defoliation of young jack pine was severe within some 3,200 acres and light to moderate within an additional 5,000 acres.

Larvae were also collected from jack pine on the south shore of Lake Athabaska in northern Saskatchewan. Tentative identification is based on the host species and positive identification will not be possible until insectary reared adults emerge in the spring. Further studies will be made of the Prince Albert infestation if it continues in 1962.

Larch Sawfly, *Pristiphora erichsonii* (Htg.)—This continues to be the most widely distributed forest insect found in outbreak numbers in Manitoba and Saskatchewan. However, considerable abatement in severity of attack occurred in 1961, in the northern section of both provinces and in eastern Manitoba. Reduction of populations in some areas was undoubtedly the result of excessively poor foliage production following several years of heavy attack. Conversely, in western Manitoba populations showed a further increase, but hot, dry, weather favoured foliage and shoot growth and higher populations were supported without an equivalent increase in defoliation. The accompanying map indicates the intensity and distribution of infestations as derived from ground and aerial surveys.

In Manitoba, defoliation was light on mature trees and severe on immature trees throughout Riding Mountain National Park and east to Lake Manitoba; moderate to severe in patches along the west side of Lake Winnipeg; light to moderate in the Duck Mountain Forest Reserve; moderate from Birch River north through Dawson Bay to The Pas; and light to moderate with occasional severe patches from The Pas north to Flin Flon and Amisk Lake. Light attack was observed as far north as surveys extended, to the boundary of open subarctic forest from Lynn Lake east to the Nelson River. Conditions east of the Nelson were not determined as a result of curtailed aerial surveys.

In Saskatchewan, severe defoliation was restricted to the Prince Albert area, where an intensification of the outbreak was noted in 1960. Patches of moderate to severe attack occurred north and east to Candle Lake, Fishing Lake, and the south end of Montreal Lake. Little change was noted in the Hudson Bay District where most of the conspicuous defoliation occurred on young tamarack, or in the Meadow Lake District where moderate to severe attack was restricted to stands near Goodsoil and Sundance. Larvae and evidence of feeding were found at nearly every ground location checked in the course of aerial surveys extending to the north boundary of the Province. There was a conspicuous lack of foliage and excessively poor shoot production on tamarack over most of northern Saskatchewan but this could not be attributed in any large measure to current sawfly attack.

Estimates of the percentage of current shoots utilized for oviposition in representative sample plots in 1959, 1960 and 1961 are shown in the following table.

Forest District	Number of sample plots	Percentage of current shoots utilized for oviposition		
		1959	1960	1961
Manitoba:				
Southern	4	2.1	1.3	2.4
Eastern	4	3.5	2.0	3.9
Western	3	1.6	5.3	16.0
Northern	4	8.0	3.3	4.7
Saskatchewan:				
Hudson Bay	3	0.7	1.8	2.1
Prince Albert	3	2.3	20.9	38.4
Northern	3	3.6	4.9	1.8
Meadow Lake	5	1.9	2.6	2.9

Balsam-fir Sawfly, *Neodiprion abietis* complex—Infestations of this defoliator continued for the second consecutive year and expanded. The largest again occurred in the Interlake area where most of the old foliage of balsam fir within some 3,600 square miles was affected. Feeding damage also occurred on black spruce in this region and on white spruce shelterbelts in an area bounded by Riverton, Hodgson and Dallas, but the characteristic reddening of the foliage was less pronounced on these species.

Elsewhere in Manitoba, moderate to severe defoliation of balsam fir was noted in the vicinity of Victoria Beach and Beaconia east of Lake Winnipeg, and at Caddy and West Hawk lakes in the Whiteshell Forest Reserve. A slight increase was evident throughout the southeastern section of Manitoba where balsam fir and black and white spruce lost up to 25 per cent of the old foliage. Larvae were commonly found on white spruce throughout the Western District, but severe defoliation occurred in only one small area north of Camperville. In the Northern District, aerial surveys revealed patches of severe defoliation of balsam fir and white spruce around Cross, Wintering and Setting lakes, and at the north end of Moose Lake.

In Saskatchewan, severe infestations continued at Dipper and Snake lakes in the Churchill River system with no apparent increase in area. Elsewhere in the Province, larvae were generally more common but no new areas of conspicuous defoliation were reported.

Yellow-headed Spruce Sawfly, *Pikonema alaskensis* (Roh.)—The distribution and abundance of this spruce defoliator increased slightly in both provinces. It occurred commonly on shelterbelt and ornamental plantings throughout the Prairie and Aspen Grove sections, and on open-growing trees and reproduction in natural forest stands in all of the forest districts. No widespread infestations or instances of host mortality were reported, but numerous local infestations causing moderate to severe defoliation of both black and white spruce occurred throughout the aforementioned areas. In combination with the balsam-fir sawfly this insect also caused severe defoliation of black spruce and light to moderate defoliation of white spruce in some parts of the Interlake Region.

Pine Needle Scale, *Phenacaspis pinifoliae* (Fitch)—Numbers of this insect increased on shelterbelt and ornamental plantings of white spruce in some parts of the southern and central districts of both provinces. In Saskatchewan, moderate to severe infestations were recorded in the Regina, Indian Head, Yorkton, Wolseley, Grenfell and Creelman areas, around Rockhaven, and in the city of Saskatoon. Light infestations occurred throughout the Western District of Manitoba except in the townsite of Wasagaming in Riding Mountain National Park where the lower crowns of many white spruce were severely infested.

Although the pine needle scale is not considered a serious pest in forested areas, it occurred at moderate infestation levels on a few white spruce and lodgepole pine in the Cypress Hills Provincial Forest.

Forest Tent Caterpillar, *Malacosoma disstria* Hbn.—As expected, outbreak conditions intensified in 1961. Heavy infestations now occur on trembling aspen in several extensive areas and in numerous smaller patches in the Mixedwood, Manitoba Lowland, and Northern Coniferous sections of the Boreal Forest Region. Larvae were commonly found in the Aspen Grove Section, but no infestations were reported. The main infestation areas and collection points are shown on the accompanying map.

In Manitoba, several small infestations were recorded east of Lake Winnipeg near Pointe du Bois and around Oiseau, Caribou, Manigotagan, Siderock, Sasaginnigak, Aikens, Family, Garner, Dogskin, Tooth, and Black lakes. The infestation in Riding Mountain National Park continued and new and more extensive infestations were recorded in the northeast portion of the Duck Mountain Forest Reserve and near Dawson Bay on Lake Winnipegosis. The most widespread infestation was recorded in the Northern District where moderate to severe defoliation of trembling aspen occurred in a triangular area extending northwest from The Pas to Amisk Lake and east to Snow Lake.

The most extensive infestations in Saskatchewan occurred around Cold Lake on the Alberta–Saskatchewan boundary, and in the Bodmin–Big River area where wandering larvae caused annoyance to residents and resort-dwellers.

Numerous patches of severe defoliation, varying in size from a few hundred acres to several square miles, continued in the Churchill River basin between Churchill Lake and Lac la Ronge. Conspicuous defoliation also recurred at Halkett (Sandy) Lake in Prince Albert National Park and in the Pasquia Hills region. The old infestation in the East and Park blocks of the Cypress Hills Provincial Forest continued for the fifth consecutive year but defoliation was less severe than in 1960. This was particularly evident in the Park Block where conspicuous defoliation was limited to isolated patches.

Intensified egg-band surveys were carried out in all of the forest districts as a means of following the spread of infestations and to predict defoliation intensity in 1962. The results are summarized in the following table:

Region	Number of sample stations	Number of stations at which egg-bands were recorded	Average number of bands per tree at positive sample stations*	Defoliation forecast for 1962
MANITOBA				
Southern District	7	1	0.3	Light
Eastern District	43	36	20	Severe
Interlake section	19	8	2	Light
Whiteshell Forest Reserve	10	6	21	Severe
Western District	24	22	23	Severe
Riding Mountain National Park	16	15	15	Severe
Northern District	27	27	41	Severe
SASKATCHEWAN				
Cypress Hills Prov. Forest	18	13	19	Severe
Prince Albert District	53	45	12	Severe
Prince Albert National Park	38	13	15	Severe
Northern District	31	23	23	Severe
Meadow Lake District	77	70	13	Severe
Hudson Bay District	21	16	28	Severe
West-central District	16	0	0	Nil

*Based on examination of three co-dominant trees at each sample station.

This indicates a further enlargement of the outbreak in 1962, with severe infestations expected in almost every district. Some of the separate infestations will probably coalesce and new ones are expected to occur at a number of points in central and northern areas. However, widespread infestations are not expected in the Aspen Grove Section and the infestation in the Cypress Hills Provincial Forest will probably show a further decline.

Prairie Tent Caterpillar, *Malacosoma lutescens* (N. & D.)—Moderate to severe infestations of the prairie tent caterpillar occurred on a variety of hosts throughout most of the region. Chokecherry and wild rose were the most frequent hosts, followed by trembling aspen, willow, wild plum, and bristly gooseberry.

In Manitoba, numerous tents were noted throughout the Sandilands Forest Reserve, and between Sidney and Carberry in the Southern District. Areas of moderate infestation occurred in Riding Mountain National Park and north of Grandview in the Western District.

Tents were found in practically all areas in Saskatchewan and unusually high concentrations occurred around Prince Albert and throughout a large portion of the Pike Lake Provincial Park. Moderate concentrations occurred between Lac la Ronge and Otter Falls in the Northern District and between Deer Hill and Lloydminster in the Meadow Lake District.

Large Aspen Tortrix, *Choristoneura conflictana* (Wlkr.)—This insect was reported from every district except the Northern District of Saskatchewan, but

populations were generally lower than in 1960. In the previous outbreak area of central Saskatchewan, conspicuous defoliation was limited to scattered patches in an area extending from Prince Albert south to the Red Deer Hills and west to Shellbrook. Severe defoliation by this insect in combination with the forest tent caterpillar was observed in the Big River area of Saskatchewan.

The following table shows the frequency of occurrence of aspen tortrix larvae in collections from trembling aspen for the last three years and indicates the general decline in populations:

District	Number of collections from trembling aspen	Percentage containing large aspen tortrix		
		1959	1960	1961
MANITOBA:				
Southern	42	13	7	2
Eastern	214	15	5	2
Northern	61	14	7	3
Western	72	55	21	11
SASKATCHEWAN:				
Hudson Bay	158	53	9	8
Prince Albert	160	11	21	11
Meadow Lake	140	7	5	4
Northern	65	17	18	0
Southern	153	9	0	1
West-Central	52	46	27	16

Fall Cankerworm, *Alsophila pometaria* (Harr.)—Severe defoliation of Manitoba maple shelterbelts was again restricted to the Swift Current, Beverely, Wymark, and Ernfold areas of southern Saskatchewan. A decline in populations was noted in the Maple Creek area where moderate to severe infestations have persisted for several years. Moderate defoliation of ash, elm, and Manitoba maple occurred in the Baildon, Crestwynd, Corinne, Moreland, and Ceylon areas. Moderate defoliation of a few elm trees was reported from Battleford, Saskatchewan.

Spiny Elm Caterpillar, *Nymphalis antiopa* (L.)—This insect was generally less abundant than in 1960, particularly in southern Manitoba. However, complete stripping of willow, and to a lesser degree of trembling aspen reproduction, occurred at scattered points in the Riding Mountain National Park in Manitoba, and in the vicinity of Montreal Lake and Lac la Ronge in northern Saskatchewan. In the prairie sections of southern Saskatchewan, a light infestation extended from the Touchwood Hills south to the Q'Appelle Valley and west through Moose Jaw to Duncairn.

Leaf Beetles on Trembling Aspen—*Gonioctena americana* (Schaeffer) and *Chrysomela crotchi* Brown—These beetles usually occurred on mature and immature trees in the same stands, but the former was particularly common on trembling aspen reproduction.

Moderate to severe defoliation occurred at various locations throughout the Southern District of Manitoba (mainly in the northern part of the Sandilands Forest Reserve), near Rosenburg in the Interlake area of the Eastern District, and in Riding Mountain National Park and the Duck Mountain Forest Reserve in the Western District. In Saskatchewan, light populations were found in aspen stands throughout all the forest districts with occasional pockets of moderate to severe defoliation in the Hudson Bay, Meadow Lake, and Northern districts.

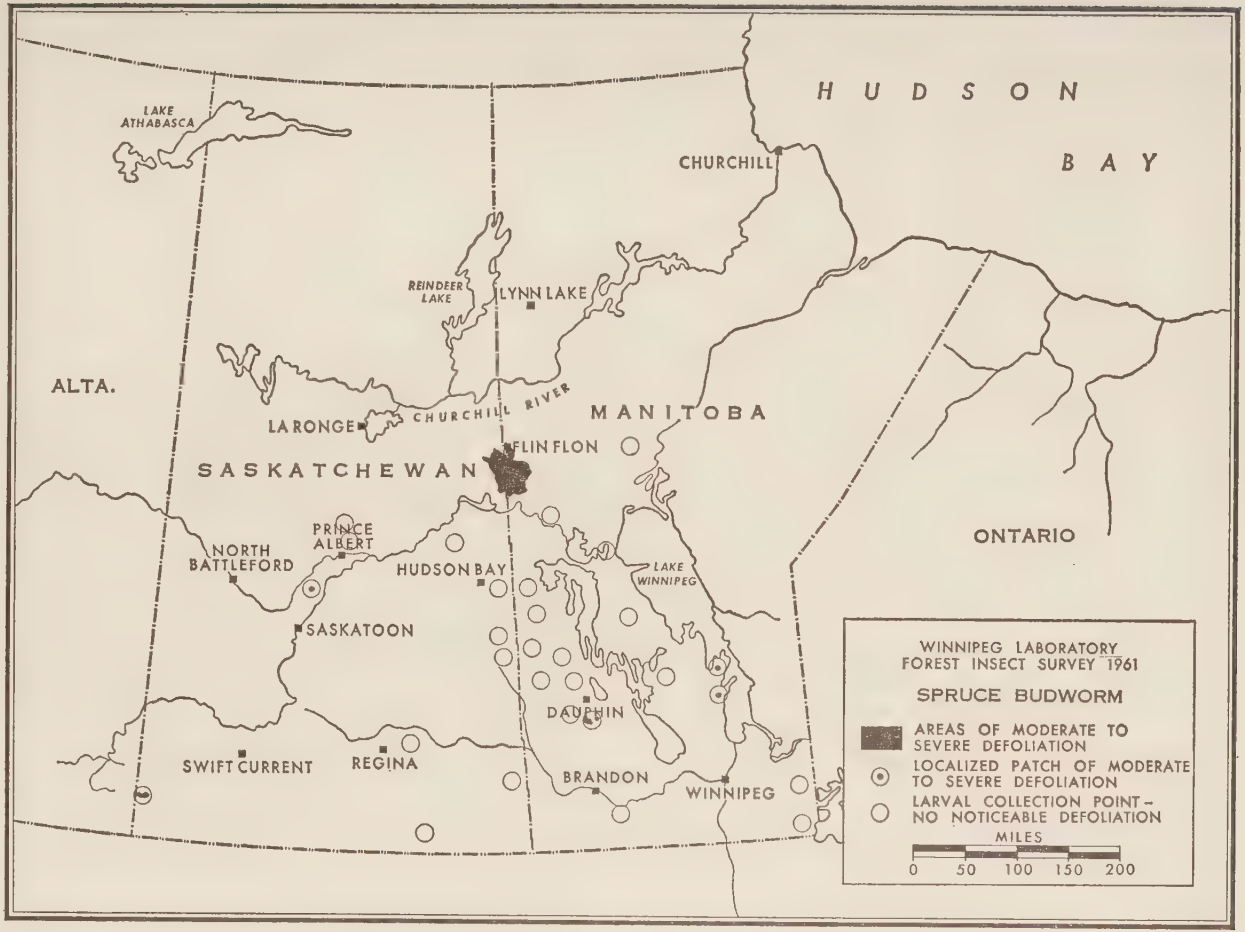
OTHER NOTEWORTHY INSECTS

Insect	Host(s)	Locality	Remarks
Acleris variana Fern. Black-headed budworm	Balsam fir and white spruce	Boreal and Mixedwood Forest regions of all districts	Light defoliation at Moon Lake in Riding Mountain National Park and noticeably increased populations in Eastern and Western districts of Manitoba and Meadow Lake, Prince Albert and Hudson Bay districts of Saskatchewan.
Acrobasis betulella Hulst Birch tube maker	White and swamp birch and alder	All districts of Manitoba and Northern District of Saskatchewan	Common, but no severe defoliation.
Altica populi Brown A poplar flea beetle	Balsam poplar	Eastern and Northern districts of Manitoba and all districts of Saskatchewan	Severe skeletonizing in many stands in southern Saskatchewan; only light damage elsewhere.
Archips cerasivoranus (Fitch) Ugly-nest caterpillar	Chokecherry	Manitoba and Saskatchewan	Commonly found throughout entire range of chokecherry; increased populations in many areas.
Archips fervidanus (Clem.) Oak webworm	Bur oak	Spruce Woods Forest Reserve, Manitoba	Nests common with some pockets of severe defoliation.
Arge pectoralis (Leach) Birch Sawfly	Birch and alder	Eastern and Northern districts of Manitoba, and Hudson Bay and Northern districts of Saskatchewan	General distribution with some light to moderate defoliation.
Dioryctria reniculella (Grote) Spruce coneworm	White spruce and balsam fir	Eastern, Western and Northern districts of Manitoba, and Northern and Southern districts of Saskatchewan	Abundant in some localities; usually in combination with the spruce budworm
Enargia decolor Wlk. A Noctuid	Trembling aspen	Manitoba and Saskatchewan	Commonly found on reproduction; pockets of moderate to severe defoliation in Hudson Bay, Prince Albert, Meadow Lake and Southern districts of Saskatchewan
Epicauta sp. A blister beetle.	Caragana	Southern Saskatchewan	Common on shelterbelts and hedges.
Fenusa dohrnii (Tischbein) European alder leaf miner	Alder	Eastern and Northern districts of Manitoba; Hudson Bay, Meadow Lake and Northern districts of Saskatchewan	Most common in Hudson Bay District.
Galerucella decora Say Grey willow leaf beetle	Willow	Manitoba and Saskatchewan	Moderate to severe skeletonizing in many localities in southeastern Manitoba; commonly found throughout range of willow.
Hylobius radicis (Buch.) Pine root collar weevil	Jack, lodgepole and Scots pine	Sandilands Forest Reserve, Manitoba	Very low populations, but host mortality from previous heavy attack continues in many plantations.
Hyphantria cunea (Drury) Fall webworm	White birch, chokecherry, dogwood and balsam poplar	Southern, Eastern and Northern districts of Manitoba	General decrease of populations; most common along west shore of Lake Winnipeg, but no severe defoliation.
Laspeyresia youngana Kft. Spruce seed worm	White spruce	Riding Mountain National Park	Common with heavy cone damage at a few localities.
Lecanium corni Bouche European fruit lecanium	Elm, ash, Manitoba maple, dogwood, and honeysuckle	Greater Winnipeg area	Heavy infestation in parts of Assiniboine Park and in southwestern part of City.
Lytta nuttallii Say Nuttall blister beetle	Caragana	Southern Saskatchewan	Moderate defoliation of shelterbelts south of Regina.
Malacosoma americanum (F.) Eastern tent caterpillar	Pin cherry	Eastern District of Manitoba and Prince Albert District of Saskatchewan	Most common in Eastern Manitoba.
Malacosoma pluviale (Dyar) Western tent caterpillar	Trembling aspen, birch, alder and willow	Eastern Manitoba and Meadow Lake District of Saskatchewan	Most common in Eastern Manitoba but no severe defoliation.

OTHER NOTEWORTHY DISEASES—concluded

Insect	Host(s)	Locality	Remarks
Neodiprion spp. complex Jack-pine sawflies	Jack pine	Throughout range of jack pine in Manitoba and Saskatchewan	*N. nanulus nanulus* and *N. virginianus* usually present, and *N. maurus* and *N. pratti banksianae* sometimes present; no serious defoliation in 1961.
Oligonychus ununguis (Jacot) Spruce spider mite	White spruce	Aspen Grove and Prairie sections of Manitoba and Saskatchewan	Very common on shelterbelt and ornamental plantings; increased populations considered to be due to hot, dry weather.
Petrova albicapitana (Busck) Pitch nodule maker	Jack and lodgepole pine	Manitoba and Saskatchewan	Occasionally found throughout; most common in Prince Albert and Meadow Lake districts of Saskatchewan
Phyllophaga and *Serica* spp. White grubs	Pine and spruce transplants	Agassiz Forest Reserve, Manitoba	No significant change in population levels. The effect of grubs on new transplants could not be estimated in 1961 because drought caused complete transplant mortality.
Pikonema dimmockii (Cress.) Green-headed spruce sawfly	Spruce	Manitoba and Saskatchewan	Light damage in southeastern Manitoba and in Hudson Bay and Prince Albert districts of Saskatchewan.
Pissodes strobi (Peck) White-pine weevil	Pines and spruces	Manitoba and Saskatchewan	Light damage in southeastern Manitoba and in Hudson Bay and Prince Albert districts of Saskatchewan.
Pleroneura borealis Felt Balsam shoot-boring sawfly	Balsam fir	Eastern District of Manitoba and Prince Albert District of Saskatchewan	Generally low populations but common where balsam fir found in Prince Albert District.
Proteoteras willingana Kft. Boxelder twig borer	Manitoba maple	Southern districts of Manitoba and Saskatchewan	General increase in numbers for the first time since 1956, but populations light.
Rhyacionia sp. A pine tip moth	Jack pine	Southern Manitoba	Common in Sandilands Forest Reserve.
Schizura concinna (A. & S..) Red-humped caterpillar	Trembling aspen, willow, pin cherry	Manitoba, and Prince Albert District of Saskatchewan	Commonly found throughout Manitoba but most numerous in Prince Albert District; no noticeable defoliation.
Semiothisa bicolorata F. A geometrid	Jack pine	Throughout range of jack pine in Manitoba snd Saskatchewan	Fairly common, most numerous in Hudson Bay, Prince Albert and Meadow Lake districts of Saskatchewan.
Semiothisa granitata Gn. A geometrid	Balsam fir and black spruce	Manitoba and Saskatchewan	Commonly found but most numerous in northern Manitoba and Hudson Bay District of Saskatchewan.
Semiothisa sexmaculata Pack. A geometrid	Tamarack	Manitoba and Saskatchewan	Commonly found but most numerous in northern Manitoba and Hudson Bay District of Saskatchewan
Tetralopha asperatella (Clem.) A webworm on aspen	Trembling aspen	Manitoba and Saskatchewan	High populations in one area of eastern Manitoba and common elsewhere.
Toumeyella numismaticum (P. & M.) Pine tortoise scale	Jack and Scots pine	Eastern and Western districts of Manitoba, and Hudson Bay and Prince Albert districts of Saskatchewan.	Light infestations at numerous localities.

Insect species	Number of Collections by Forest Districts											
	Manitoba					Saskatchewan						
	Southern	Eastern	Northern	Western	Riding Mountain National Park	Hudson Bay	Prince Albert	Meadow Lake	Northern	Prince Albert National Park	Southern	West-central
Acleris variana	2	10	3	9	8	5	5	9	2	0	0	1
Acrobasis betulella	3	9	5	2	2	0	0	0	2	0	0	1
Alsophila pometaria	0	0	0	0	0	0	1	0	0	0	17	1
Altica populi	0	1	3	0	0	2	5	0	1	1	19	4
Arge pectoralis	0	2	5	0	0	4	0	0	2	0	0	0
Argyrotaenia sp.	0	0	0	0	0	0	12	0	1	0	0	0
Choristoneura conflictana	1	5	2	8	9	11	13	5	0	3	2	8
Choristoneura fumiferana	6	28	36	6	14	7	3	0	9	0	4	1
Choristoneura pinus	18	10	4	1	1	1	10	1	0	0	0	0
Chrysomela crotchi	9	27	7	30	11	37	8	7	5	0	40	4
Enargia decolor	1	6	1	5	3	19	10	14	2	1	13	3
Fenusa dohrnii	0	3	4	0	0	19	0	2	2	0	0	0
Galerucella decora	16	18	3	1	0	11	5	6	4	0	0	0
Gonioctena americana	0	10	4	5	6	17	14	25	4	4	9	0
Hyphantria cunea	9	9	3	0	0	0	0	0	0	0	0	0
Laspeyresia youngana	0	0	0	2	0	0	0	0	0	0	0	0
Malacosoma americanum	0	7	0	0	0	0	1	0	0	0	0	0
Malacosoma disstria	4	120	43	43	27	72	109	132	75	22	42	12
Malacosoma lutescens	5	5	0	2	4	1	22	3	6	0	16	17
Malacosoma pluviale	0	16	0	0	1	0	0	1	0	0	0	0
Neodiprion abietis	20	73	11	18	10	6	2	6	5	1	0	1
Neodiprion nanulus nanulus	17	3	0	0	5	2	1	6	0	0	0	0
Neodiprion virginianus	0	1	4	1	0	0	6	2	0	0	0	0
Nymphalis antiopa	1	1	0	0	0	1	9	2	2	0	8	4
Petrova albicapitana	2	11	4	0	1	4	27	19	3	1	1	0
Phenacaspis pinifoliae	8	6	0	0	1	0	0	0	0	0	5	3
Pikonema alaskensis	10	25	16	13	16	56	33	44	10	7	4	10
Pikonema dimmockii	5	12	10	4	7	39	12	29	3	4	1	4
Pissodes strobi	3	3	1	1	0	5	13	7	1	3	0	0
Pristiphora erichsonii	12	29	8	7	12	27	36	34	17	11	1	2
Proteoteras willingana	0	8	0	0	0	1	5	5	0	0	12	11
Schizura concinna	2	6	2	2	5	0	8	0	0	0	0	0
Semiothisa bicolorata	2	0	7	0	0	8	5	9	1	0	0	0
Semiothisa granitata	5	6	17	1	0	24	4	6	2	2	1	0
Semiothisa sexmaculata	9	8	6	4	3	14	8	25	5	3	4	0
Tetralopha asperatella	1	12	3	0	0	13	15	3	6	0	3	4
Toumeyella numismaticum	0	12	0	1	0	2	5	0	0	0	0	0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FLIN FLON
SASKATCHEWAN
PRINCE ALBERT
NORTH BATTLEFORD
HUDSON BAY
LAKE WINNIPEG
ONTARIO
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SWIFT CURRENT
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BRANDON
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WINNIPEG LABORATORY
FOREST INSECT SURVEY 1961
SPRUCE BUDWORM
AREAS OF MODERATE TO SEVERE DEFOLIATION
LOCALIZED PATCH OF MODERATE TO SEVERE DEFOLIATION
LARVAL COLLECTION POINT – NO NOTICEABLE DEFOLIATION
MILES
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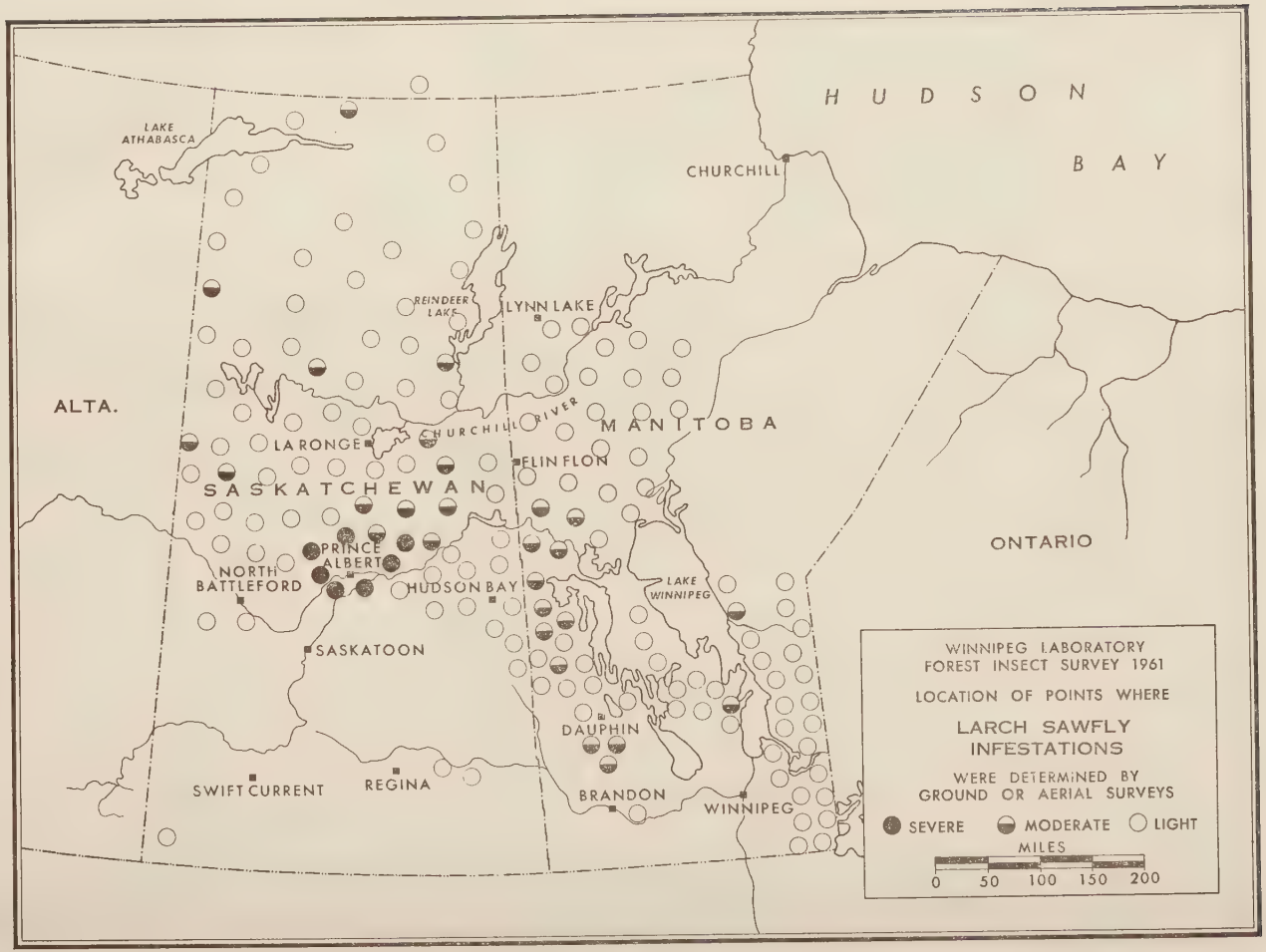
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WINNIPEG
SASKATOON
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SWIFT CURRENT
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WINNIPEG
WINNIPEG LABORATORY
FOREST INSECT SURVEY 1961
LOCATION OF POINTS WHERE
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WERE DETERMINED BY
GROUND OR AERIAL SURVEYS
SEVERE
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MILES
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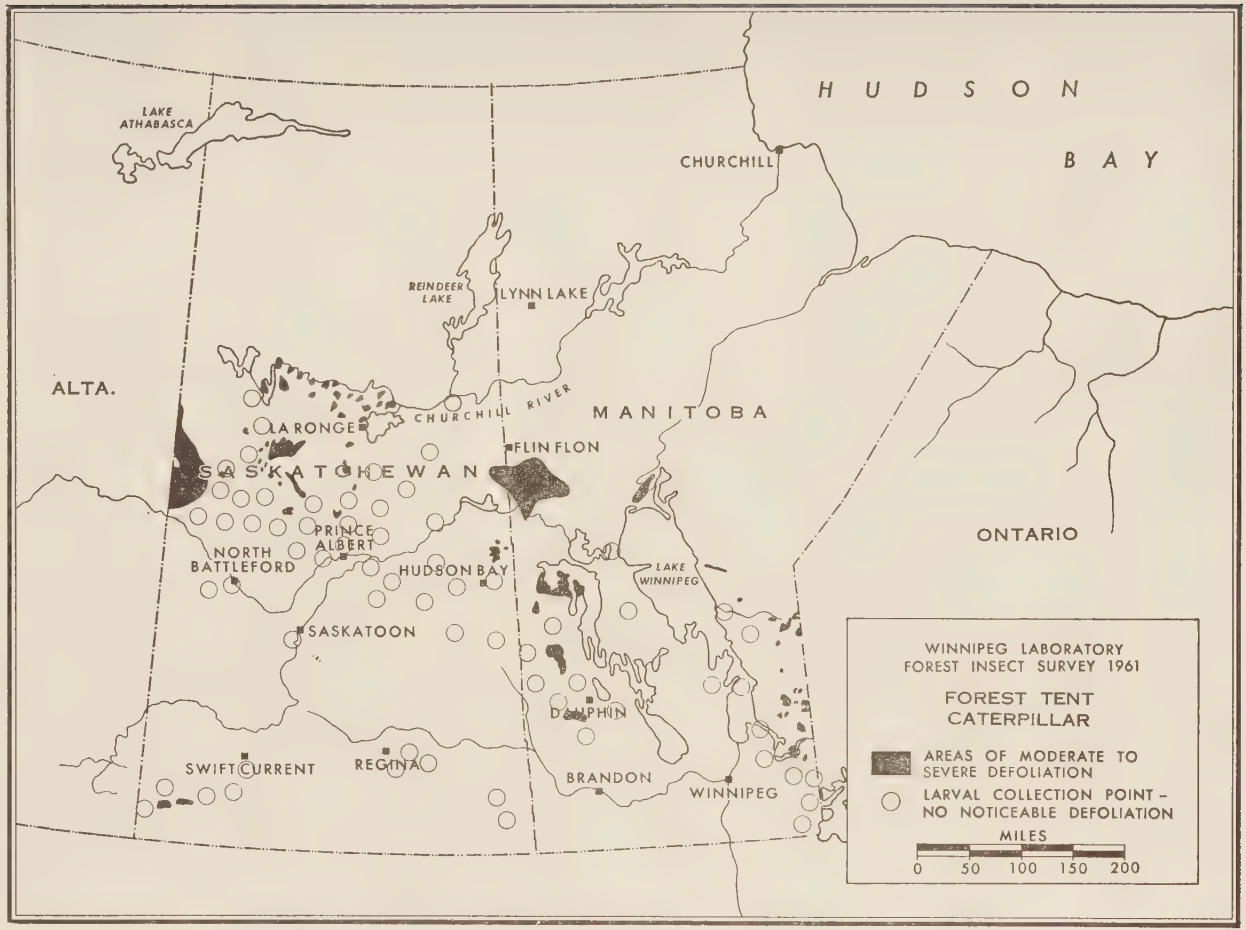
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REGINA
BRANDON
WINNIPEG
WINNIPEG LABORATORY
FOREST INSECT SURVEY 1961
FOREST TENT CATERPILLAR
AREAS OF MODERATE TO SEVERE DEFOLIATION
LARVAL COLLECTION POINT - NO NOTICEABLE DEFOLIATION
MILES
0 50 100 150 200

PROVINCES OF MANITOBA AND SASKATCHEWAN

FOREST DISEASE SURVEY

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INTRODUCTION

Survey activities in this region were restricted to special projects of particular interest, and newly observed conditions that might prove to be important. Extremely high temperatures and serious drought conditions occurred throughout Manitoba and Saskatchewan. It is believed that these conditions were primary in a high percentage of the enquiries received from owners of shade trees and wind-breaks, and also in many of the conditions reported by the Survey field men. Sporophores of many common disease fungi did not develop. This was particularly noticeable among the Agarics. Dieback was unusually common in planted trees and in deciduous stock, especially birch, in commercial nurseries where irrigation was necessarily limited.

IMPORTANT DISEASES

Macrophoma Gall of Poplars—Galls were collected in Bronson Provincial Forest near the western boundary of Saskatchewan, and in seven localities in and near Whiteshell and Agassiz forest reserves near the eastern boundary of Manitoba. Both *Macrophoma tumefaciens* Shear and *Cucurbitaria staphula* Dearness ex R. H. Arnold and R. C. Russell sp nov. (conidial stage only) were found in all collections excepting three from Manitoba. This extends the range of *C. staphula* which has previously been reported from Central Saskatchewan only.

Pine Rusts[1]—Globose galls bearing aecia (possibly Woodgate rust, *Peridermium harknessii* J. P. Moore) were found on Scots pines in a wind-break at Hadashville, Manitoba. A typical gall was found on a 2–0 Scots pine nursery seedling in the same locality.

Cronartium sp. (*Peridermium* possibly *stalactiforme* Arth. & Kern) was found on *Castilleja rhexifolia* Rydb. at Candle Lake, Sask. Infections were sparse. This is the first time a *Cronartium* has been found on *Castilleja* in Manitoba or Saskatchewan, although it has been an object of search for many years. Globose galls and stem cankers, typical of those caused by *P. harknessii* and *P. stalactiforme* occur on jack pine in the same general locality.

Root Rots—White spruce stands were sampled for root rot caused by *Polyporus tomentosus* Fr. in 11 stands in Saskatchewan and Manitoba. Six new locations for this disease were added to the previously reported list. These tend to substantiate the supposition that this disease is of general occurrence throughout the host range in these Provinces. No sporophores of *P. tomentosus* were found in 1961, even in a careful search of locations where they have been collected regularly in other years. It is assumed that this was related to the drought which prevailed throughout the region in 1961.

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[1]There exists so much uncertainty about the proper identity of the rusts concerned here, that the specific names used must be considered provisional only. "*Cronartium cerebrum* Hedge. & Long", as reported in the Annual Report of the Forest Insect and Disease Survey, p. 143, 1951, should be considered doubtful.

Root decay caused by *Armillaria mellea* (Vahl ex Fr.) Quél. appeared in 9 of the above samples; it was reported also on jack pine in several widely scattered localities. Jack pine trees up to 2 inches diameter are commonly killed by this fungus.

Butt Rot—In this special survey, logged white spruce stands were sampled for the occurrence of butt rot caused by *Flammula alnicola* (Fr.) Kummer at stump height. Seven hundred stumps were examined in 11 localities. The disease was found in 2 localities, near Lac du Bonnet, Man., and near McBride Lake, Sask. This result supports the earlier conclusion that although this disease has a very wide range it is not generally common. Because the fungus usually infects roots at points close to the stump, it is doubtful if a root sampling survey would have revealed a higher incidence of the decay.

PROVINCE OF ALBERTA

FOREST INSECT SURVEY

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INTRODUCTION

Continuation of the forest tent caterpillar and larch sawfly outbreaks, and increased activities of the spruce budworm highlighted forest insect conditions in the Alberta Region in 1961. A bad fire season focused attention on the damage caused by wood-boring insects to fire-killed timber. A tube maker on pine was discovered in outbreak proportions for the first time in Alberta.

The forest tent caterpillar caused moderate to severe defoliation over an estimated area of 26,000 square miles east of Edmonton and in the Peace River region. The area of heavy defoliation by the larch sawfly continued to extend to the west and north and now covers most of the northern part of the Province. Spruce budworm infestations occurred in north-central Alberta, in the Cypress Hills, and along the Slave, Liard, and Mackenzie rivers.

Surveys by boat covered approximately 2,000 miles on the Slave, Liard, Nahanni, and Mackenzie rivers. Increased charter facilities in the northern part of the Region made possible more effective aerial surveys. The Alberta Forest Service provided a helicopter for two days for a survey of damaged pine in northeastern Alberta. Their assistance in this and other survey operations is gratefully acknowledged.

The 2,223 collections received in 1961 were distributed among the principal host trees as follows:

Coniferous Trees	Collections	Broad-leaved Trees	Collections
White spruce	310	Trembling aspen	707
Lodgepole pine	210	Willow	278
Tamarack	162	Balsam poplar	74
Jack pine	54	Manitoba maple	52
Black spruce	40	Alder	45
Douglas fir	26	Birch	24
Engelmann spruce	23	Chokecherry	17
Alpine fir	16	Elm	6
Alpine larch	8	Ash	6
Limber pine	7	Dogwood	5
Balsam fir	5	Cottonwood	3
Scots pine	3		
Total	864	Total	1,217
Miscellaneous hosts	142		
Grand Total	2,223		

IMPORTANT INSECTS

Larch Sawfly, *Pristiphora erichsonii* (Htg.)—Populations of the larch sawfly continued at a high level in 1961. In many areas in the northeastern part of the Province where serious defoliation has occurred for several years, needle and shoot production was very sparse. The larch sawfly continued to spread to the west and north, and in 1961 was reported along the Mackenzie River approximately 20 miles northwest of Fort Simpson and near an unnamed lake 30 miles northwest of Nahanni Butte near the junction of the South Nahanni and Liard rivers.

In Alberta, moderate to severe infestations now reach almost to the British Columbia boundary. Although a sizeable area in the northcentral part of the Province was not surveyed in 1961, surveys in that area in 1960 revealed large areas of severe defoliation and it is likely that similar conditions prevailed this year. As indicated in the accompanying map, the larch sawfly caused moderate to severe damage throughout the range of tamarack with the exception of the following areas where light infestations were present: along the Eastern Rockies Conservation Board Road north of the Red Deer River, in a wide band south of Grande Prairie and Valleyview, between the Peace River and the British Columbia boundary as far north as Keg River and in the extreme northwest corner of the Province.

In the Northwest Territories, severe defoliation was present from the south shore of Great Slave Lake to the Alberta boundary between the Slave River and the western side of Tathlina Lake. Outside this area moderate defoliation extended for approximately 50 miles north of Fort Providence along the Yellowknife Highway. Moderate, decreasing to light, defoliation extended from the western side of Tathlina Lake to the Redknife River. On the north side of the Mackenzie River, patches of moderate and light defoliation occurred between the Spence and Rabbitskin rivers, and to within 17 miles of Yellowknife. As mentioned above, larch sawfly damage was observed 30 miles northwest of Nahanni Butte where defoliation was very light, and 20 miles northwest of Fort Simpson where damage was moderate.

The results of sequential sampling in the following table indicate the infestation classes at the sampling stations in 1959, 1960, and 1961:

Location	Infestation class			Location	Infestation class		
	1959	1960	1961		1959	1960	1961
High Level	nil	light	moderate	Speddon	nil	nil	nil
Keg River	nil	moderate	moderate	Barrhead	severe	severe	moderate
Clear Prairie	light	nil	light	Obed	nil	light	moderate
Grimshaw	light	moderate	moderate	Gainford	light	light	moderate
Watino	moderate	moderate	moderate	Edmonton	moderate	light	moderate
Grouard	light	light	severe	Peers	light	light	light
Slave Lake	light	moderate	severe	Muskeg River	nil	nil	moderate
Calling Lake	moderate	nil	severe	Mercoal	light	moderate	severe
Grande Prairie	light	light	light	Millet	light	light	severe
Lac La Biche	light	nil	severe	Winfield	light	light	light
Flatbush	moderate	moderate	moderate	Nordegg	light	moderate	light
Cold Lake	light	nil	light	Rocky Mtn. House	severe	severe	severe
Iosegun Lake	nil	light	light	Clearwater	moderate	severe	moderate
Perryvale	severe	light	moderate	Caroline	moderate	light	moderate
Whitecourt	moderate	light	severe	Miette	—	light	severe

Spruce Budworm, *Choristoneura fumiferana* (Clem.)—As shown on the accompanying map, the activities of the spruce budworm increased in many parts of the Region in 1961. One-year-cycle spruce budworm caused severe damage in north-central Alberta, in the Cypress Hills, and along the Slave, Mackenzie, and Liard rivers in the Northwest Territories. The two-year-cycle spruce budworm caused heavy damage in a small area near Saskatchewan Crossing in Banff National Park, and light damage in Yoho National Park. Heavier damage can be expected from the two-year-cycle spruce budworm in 1962.

In the Cypress Hills in southeastern Alberta, the amount of damage increased in 1961. Moderate defoliation extended from the Saskatchewan Boundary for about 4 miles up Graburn Creek. Small patches of severe defoliation occurred within this area and for a short distance up Battle Creek. Large numbers of *Dioryctria reniculella* (Grote) larvae were present in this infestation. Continued defoliation over the past few years caused some top killing.

In north-central Alberta, the spruce budworm caused severe damage to a merchantable white spruce stand near Loon Lake. Farther north along the

Wabiskaw River, damage to white spruce and balsam fir was observed from 10 miles north of the junction of the Loon and Wabiskaw rivers to 4 miles north of the junction of the Muddy and Wabiskaw rivers. Defoliation was light at the southern end of this infestation, gradually increasing to moderate and severe near the mouth of the Muddy River, then decreasing to light farther north. Severe defoliation extended up the Muddy River for about 8 miles. In this area dead spruce and balsam fir occurred in the understory, and many dead tops were observed.

The spruce budworm was found in four areas in the Northwest Territories: along the Slave River, along the Mackenzie Highway, and in the valleys of the Mackenzie and Liard rivers. Moderate to severe defoliation occurred in the east bank of the Slave River opposite Fort Smith, at 8 miles north of Salt River, on Le Grand Detour Peninsula, and on both banks of the Slave River from Brûlé Point to near McConnell Island. Heaviest damage occurred on Long Island. Near Enterprise on the Mackenzie Highway, white spruce in a small area extending for a mile along the Highway were moderately defoliated.

In the Mackenzie River Valley, infestations of the spruce budworm were at their lowest level since surveys were begun in 1955. Severe defoliation occurred around Fort Simpson and extended up the Liard River to within 10 miles of the mouth of the Poplar River. Light defoliation extended for 10 miles on each side of the severe defoliation around Fort Simpson. Moderate to severe defoliation was evident for about 20 miles up the Blackburn River from its junction with the Mackenzie. Light to moderate defoliation was observed near Camsell Bend, near the River between Two Mountains, and along the Keele, Redstone and Dahadini rivers.

Along the Liard River moderate to severe defoliation was observed from 25 miles north of Fort Liard to 15 miles south of the British Columbia Boundary. Similar conditions prevailed along the Petitot River for 18 miles from its mouth. On the west side of the Liard River, severe defoliation was observed in the valley around Fisherman Lake and for 30 miles up the Kotaneelee River Valley. Light defoliation extended another 10 miles up the Kotaneelee River Valley, and occurred along the Liard River from 25 miles north of Fort Liard to 5 miles south of Nahanni Butte.

Forest Tent Caterpillar, *Malacosoma disstria* Hbn.—Forest tent caterpillar infestations increased in size and intensity in east-central Alberta and the Peace River region, and an estimated 26,000 square miles of aspen were either moderately or severely defoliated by this insect in 1961 (see accompanying map). Weather conditions in the spring were ideal for the hatching of eggs and eth establishment of the young larvae; larval mortality was low except where defoliation was complete before the larvae were mature. This was a common occurrence in the Peace River region where warm weather early in the season caused very rapid larval development. In several places larval development was complete before the trees had expanded their full complement of leaves. This caused the formation of very large leaves on the tips of some branches on trees which were otherwise completely defoliated.

Two very large areas of severe defoliation were observed, one an extension of the Elk Point outbreak which has persisted since 1957 and the other along the Peace River which was reported as patches of heavy defoliation in 1960. The Elk Point outbreak has increased in size from 4,000 square miles in 1960 to approximately 12,000 square miles in 1961. It was bounded on the north by Gordon Lake and the Hangingstone River; on the east by the north fork of the House River, the Wandering River and the towns of Vilna, Willingdon, Mannville and Bittern Lake; on the south by Bittern Lake and Provost; and on the east by Provost, Lloydminster, Hazeldine and the Saskatchewan Boundary as far north as Winefred Lake. There was a break of approximately 20 miles in the

heavy defoliation between Winefred and Cowpar lakes. Heavy defoliation was present from Cowpar Lake north to Gordon Lake and east to the Saskatchewan Boundary.

In the Peace River region severe, interspersed with moderate, defoliation extended in a wide band from High Prairie and Dunvegan to approximately 25 miles north of Fort Vermilion and covered an area of approximately 8,000 square miles. Smaller areas of severe defoliation totalling 6,000 square miles occurred near Little Smoky Settlement, Sturgeon Lake, Bad Heart River, Belloy, south of High Prairie and Driftpile, near Smith and Fawcett Lake, and at Bondiss, Whitecourt and Blue Ridge.

The forest tent caterpillar was found in fairly high numbers throughout most of central Alberta. For the first time in many years it was found in Yoho and Kootenay national parks; infestations were light.

Rearing data indicated that this outbreak was still vigorous. Pupal parasitism in collections from the Elk Point outbreak averaged 37 per cent, with a high of 85 per cent. Virus disease caused a 15 per cent loss in field collected pupae. Larval mortality attributable to virus infection was approximately 30 per cent, but this figure may have been increased by contamination in rearing. In the Peace River region, pupal parasitism averaged 10 per cent and mortality of field collected pupae from disease was 30 per cent.

Predicted defoliation for 1962 based on sequential sampling of egg bands is presented in the following table. The defoliation in 1961 is also given.

Location	Defoliation 1961	Predicted defoliation 1962	Location	Defoliation 1961	Predicted defoliation 1962
Whitelaw	severe	severe	Bonnyville	severe	severe
Peace River	severe	severe	Debolt	light	severe
Dixonville	severe	moderate	Sturgeon Lake	moderate	severe
McLennan	light	moderate	High Prairie	moderate	severe
Donnelly	moderate	moderate	Driftpile	moderate	severe
Lac La Biche	light	severe	Slave Lake	light	severe
Grassland	nil	moderate	Fawcett Lake	severe	severe
Calling Lake	light	severe	Huallen	nil	light
Athabasca	light	severe	Demmitt	nil	light
Rochester	nil	light	Baytree	nil	light
Ashmont	severe	severe	Spirit River	nil	light
Elk Point (N)	severe	severe	Tanget	light	severe
Elk Point (S)	severe	severe	Grovedale	nil	nil
Dewberry	moderate	light	Blue Ridge	severe	severe
Vermilion (E)	moderate	severe	Whitecourt	severe	severe
Vermilion	moderate	severe	Little Smoky	severe	severe
Mannville	severe	severe	Lavoy	light	light
Two Hills	nil	light	Edgerton	moderate	light
Andrew	nil	light	Fabyan	light	light
Star	nil	light	Mundare	light	light
Warspite	light	light	Edmonton	nil	nil
Vilna	light	light	Provost	light	light
Brierville	severe	severe	Rivercourse	light	light
Wandering River	nil	severe	Ribstone	light	light
Beauvallon	severe	severe	Hughenden	light	light
Cold Lake	severe	severe	Lougheed	light	light
Ellscott	light	moderate	Phillips	light	light
Deadwood	light	moderate	Wanham	severe	severe
Entwistle	light	nil	La Crete	severe	moderate
Ryley	light	light			

Leaf Beetles, *Chrysomela aenicollis* (Schaeff.), *Chrysomela alnicola alnicola* Brown, *Chrysomela schaefferi* Brown, *Goniocteina americana* Schaeff., and *Galerucella decora* (Say)—There was a marked increase in the numbers of leaf eating beetles in 1961 over those reported in 1960. Infestations of the grey willow leaf beetle, *G. decora*, were present in the area bounded by Caroline, Lloydminster, Lesser Slave Lake, and the Smoky River. Severe defoliation of willow occurred near Rocky Mountain House, Pigeon Lake, Ricinus, Caroline, and along Highway 2 from Lacombe to Wetaskiwin. Severe defoliation was also reported along Highway 16 from Carvel to Pembina Provincial Park, from Edson to the boundary of Jasper National Park, in the foothills west and north of Entrance, along the Wapiti River, south and east of Lesser Slave Lake, and near Wandering River.

Moderate skeletonizing of willow was reported from the Vegreville-Lloydminster area and near Stettler.

A leaf-eating beetle *C. aenicollis* caused heavy damage to willow at the Highwood Pass on the Coleman–Kananaskis Highway, 4 miles up the Otterhead River in Yoho National Park, along the Cascade Fire Trail from Cuthead to Panther Lodge, on Mount Coleman, in Flint Park in Banff National Park, and in the foothills west and north of Entrance. These are all areas of high elevation. Moderate damage was reported from along the Mountain Park Road south of Cadomin.

In Yoho National Park near Wapta Falls, *C. schaefferi* caused light to moderate damage to willow. Another species believed to be *C. alnicola alnicola* caused severe defoliation of alder at the south end of the Ice River Road.

The American aspen beetle, *G. americana* caused heavy damage to trembling aspen near the Highwood and Sheep ranger stations in southwestern Alberta. Small areas of moderate damage were reported from the North Fork Ranger Station to Millarville, at Lundbreck, Innisfree, Lloydminster, Whitecourt, Smith, Simon Lakes and Hines Creek. Light infestations were present at widely separated locations throughout much of the aspen growing area.

Aspen Leaf Miner, *Phyllocnistis populiella* Cham.—Infestations of this insect in the western part of the Region increased in intensity in 1961. Mined leaves could be found in almost all the aspen stands in the region but only in the west were these insects numerous enough to give the trees the silvery appearance characteristic of a heavy infestation. Severe damage was reported from the southern half of Kootenay National Park and from Field to Leanchoil in Yoho National Park. Leaf miners were also numerous in the Athabasca Valley in Jasper National Park as follows: from Athabasca Falls to the Snaring River, from the junction of the Athabasca and Miette rivers up the Miette Valley to the Park Boundary, and from the mouth of the Maligne River up the Maligne Valley for 8 miles. Outside the Parks, high populations were reported from the Entrance–Hinton, Ricinus–Caroline, and Lacombe–Stettler areas. Heavy infestations were present along the Liard River from the Poplar to the Matou rivers and along the Mackenzie River Valley from a point 10 miles east of Camsell Bend to Fort Wrigley. High populations were also present along the South Nahanni River Valley about 40 miles upstream from its junction with the Liard River.

Yellow-headed Spruce Sawfly, *Pikonema alaskensis* (Roh.)—Populations of the yellow-headed spruce sawfly remained at low levels. Heavy defoliation occurred in a few farm shelterbelts at Valleyview, Plamondin, Olds, Alix, Cochrane, Delia, and Bassano. Light to moderate defoliation was reported from Legal, Boyle, Spruce Grove, Atcheson, Stony Plain, Westlock, and Morinville.

On the Yellowknife Highway light defoliation of white spruce extended from Mile 21 to Mile 63, with a small area of heavy defoliation at Mile 34. A few heavily defoliated small white spruce were reported along the Slave River. The tops of black spruce were severely defoliated in a small area at Mile 100 on the Mackenzie Highway.

Bruce Spanworm, *Operophtera bruceata* (Hulst)—Populations of the Bruce spanworm were very low in 1961 except in an area in east-central Alberta bounded by Mundare, Lloydminster, Provost and Bittern Lake. Highest populations occurred along Highway 16 from 5 miles east of Mannville to Islay. Elsewhere in this area population levels were moderate or light. The amount of defoliation caused by this insect was difficult to determine because of the presence of the forest tent caterpillar in the same stands.

Spruce Spider Mite, *Oligonychus ununguis* (Jac.)—Spruce spider mite damage increased in 1961. Moderate to heavy damage was reported on farm

shelterbelts in the North Star–Manning area and near Wetaskiwin, Lacombe, Red Deer, and Stettler. Light to moderate damage was reported on shelterbelts near Taber, Brooks, Sexsmith, and in the City of Red Deer.

Spruce hedges and shade trees in Banff Townsite were heavily infested and showed considerable discoloration. Moderately heavy infestations were present on the grounds of Jasper Park Lodge. Although populations in Jasper Townsite had increased from those reported in 1960, damage was light. A light infestation of spruce spider mite was reported on Douglas fir near Sinclair Canyon in Kootenay National Park.

Leaf Rollers on Aspen, *Compsolechia niveopulvella* (Cham.) and *Pseudexentera improbana oregonana* Wlshm.—Moderate damage was caused by the latter species along Highway 16 from Vegreville to Lloydminster and in the Wainwright, Whitecourt, Hardisty, and Camrose districts. Elsewhere in the region population levels of this insect were low. Very few collections of *C. niveopulvella* were received in 1961.

Wood Borers, *Monochamus oregonensis* (Lec.), *Monochamus* sp. *Saperda calcarata* Say—Increased interest in salvaging fire-killed timber in Alberta has focused attention on wood boring insects. In the Grande Prairie Forest Division, large quantities of spruce and lodgepole pine were heavily infested with *M. oregonensis*, and possibly other species of *Monochamus* following late spring fires. These insects quickly established themselves, and by the fall of 1961 many had reached their maximum penetration and some had completed their larval tunnels. In this and other areas in north-central Alberta wood borers seriously reduced the possibility of salvage.

The poplar borer, *S. calcarata* caused moderate damage to aspen just inside the eastern entrance of Banff National Park and on the golf course in Waterton Lakes National Park.

Fall Cankerworm, *Alsophila pometaria* (Harr.)—Infestation levels of the fall cankerworm remained similar to those reported in 1960. Heavy defoliation of farm shelterbelts occurred at New Dayton, Magrath, and 25 miles east of Milk River. Moderate defoliation was reported from Cranford, Pearce, Vauxhall, and Alsask. Light defoliation occurred at widely separated locations south of Highway 1.

The Cooley Spruce Gall Aphid, *Adelges cooleyi* (Gill.)—Populations of the Cooley spruce gall aphid, although not as numerous as in 1960, remained higher than usual in 1961. On native white spruce the highest numbers were found in the area west of Highway 2, south of a line through Nordegg and Red Deer. Planted spruce in farm shelterbelts and shade trees near Brooks, Red Deer, Wetaskiwin, Camrose and the southern half of the Peace River region were heavily attacked.

Populations of the generation on Douglas fir were generally lower than in 1960, but this host was severely infested two miles west of the Highwood Ranger Station. Light populations were reported in the southern part of Banff and Kootenay national parks.

A Pine Tube Maker, *Argyrotaenia tabulana* Free.—This insect, believed to be *A. tabulana*, was reported causing considerable damage to jack pine in northeastern Alberta. The infested area covered about 350 square miles and extended east from the Athabasca River between Townships 98 and 103. A high percentage of the trees were severely defoliated. Some of these trees were also suffering from drought and as a result were almost completely red. (See Forest Disease Survey Section). These red trees were plainly visible from the air and comprised an estimated 20 per cent of the stands.

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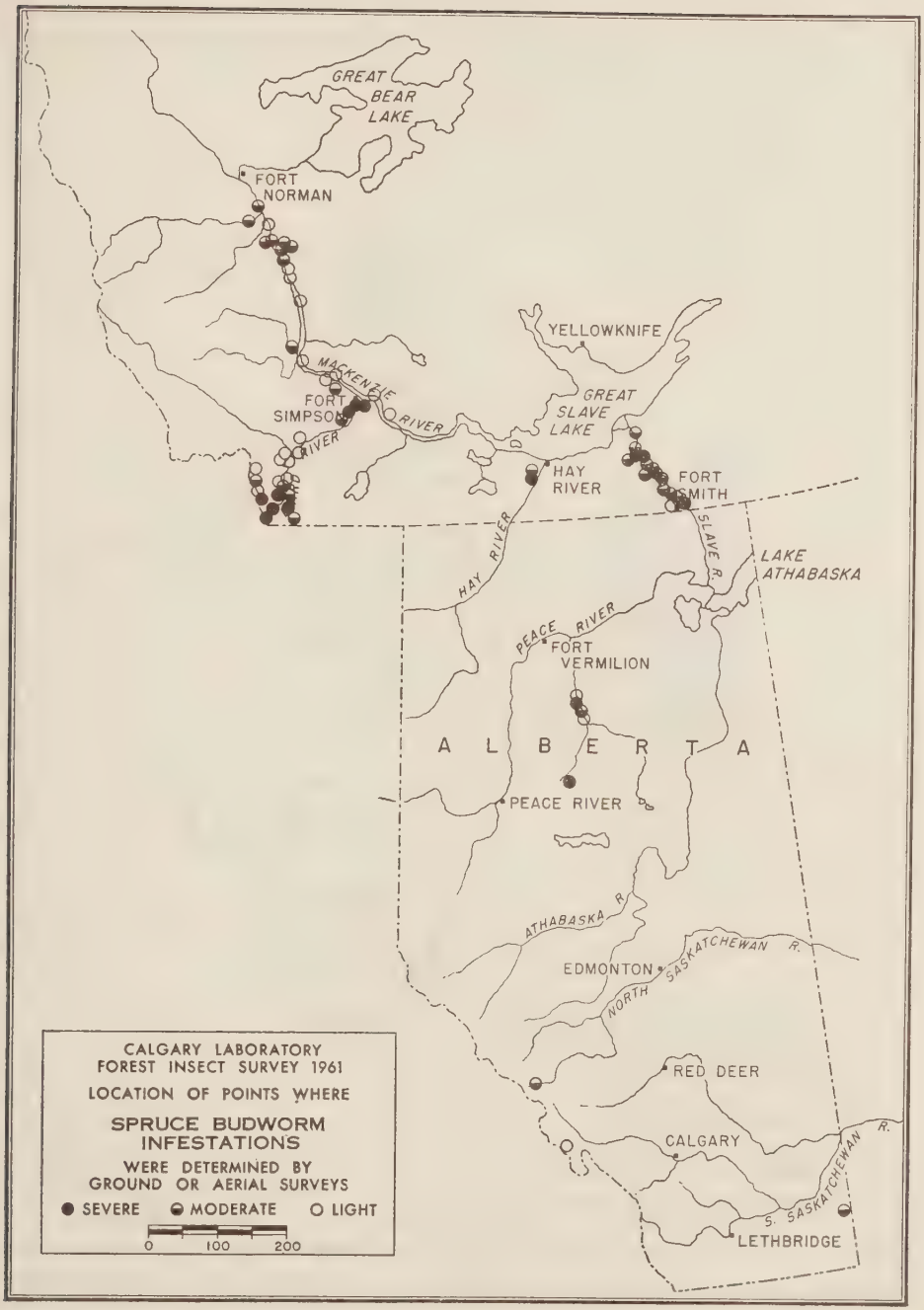
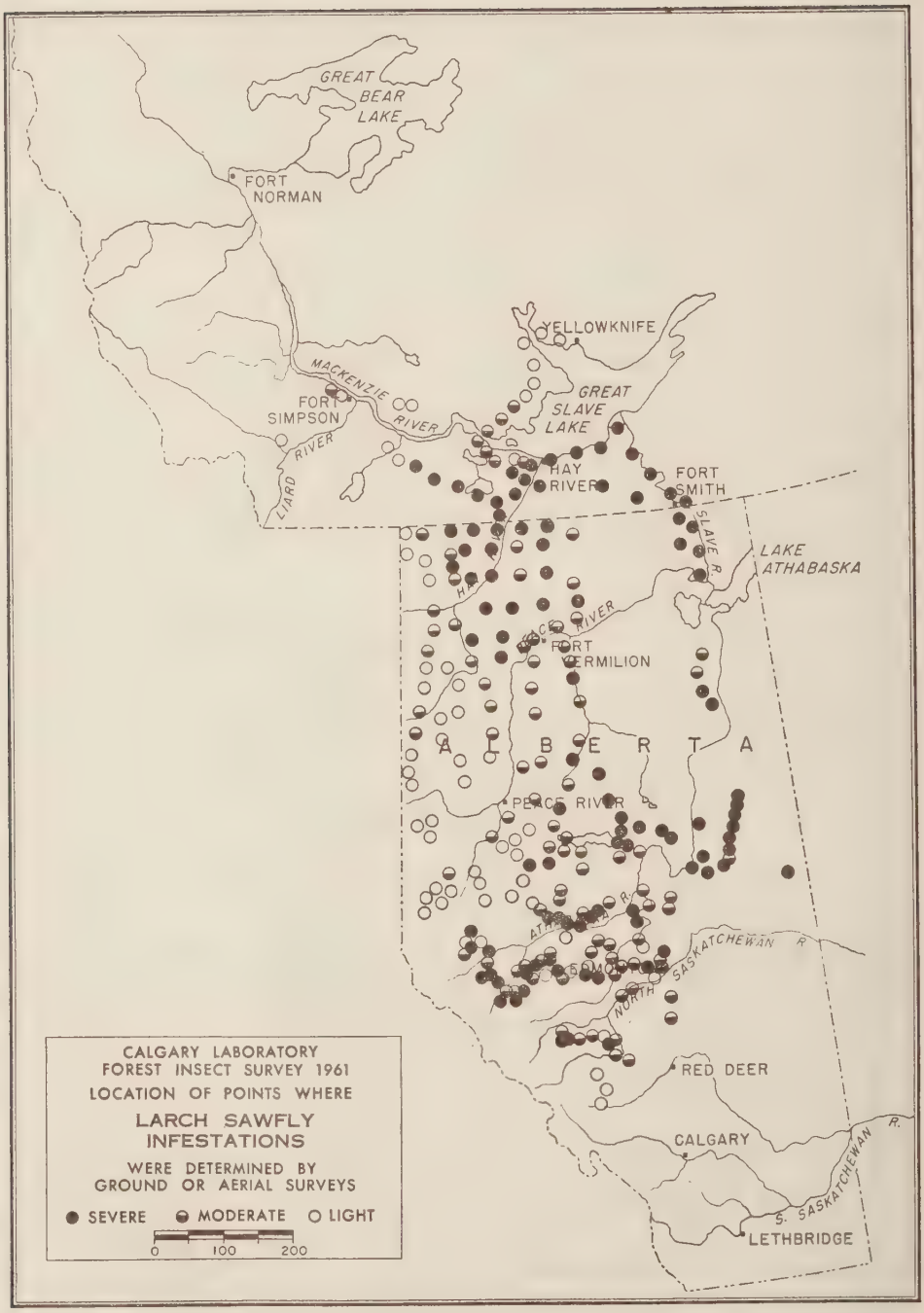
A few collections of *A. tabulana* have been received almost every year since the Survey began in 1948. The number of collections has varied little from year to year and it has not been considered a serious pest. Prior to 1961 the only known outbreak of this insect occurred in Yellowstone National Park from 1921 to 1925.

Poplar and Willow Borer, *Sternochetus lapathi* (L.)—This is believed to be the first report of the occurrence of this insect in Alberta. The infested area extended for approximately 8 miles along Ptolemy Creek near Coleman in the Crowsnest Pass. Willows from 1 to 4 inches in diameter were heavily infested and some stems were dead. The size of the infested area and the number of dead stems indicate that the weevil has been present in this area for several years.

OTHER NOTEWORTHY INSECTS

Insect	Host	Locality	Remarks
Archips cerasivoranus (Fitch)	Aspen, willow	Peace River, Waterton Lakes National Park	Small infestations.
Dryocoetes confusus Sw.	Alpine fir	Hinton-Robb	Contributed to the death of overmature trees damaged by logging.
Eriophyid mites	Cottonwood, balsam poplar	Southern Alberta	Heavy in shelterbelts and shade trees.
Evagora starki Free.	Lodgepole pine	Rocky Mountain National Parks	Little change in population levels; winter mortality light.
Fenusa sp.	Birch	Calgary	Moderate infestations on shade trees.
Gracillariid sp.	Alder, lilac	South-central Alberta	Common on ornamentals.
Hylobius warreni Wood	Lodgepole pine, white spruce	Cypress Hills, South-central Alberta	High populations near Robb.
Ips spp.	Lodgepole pine, white spruce	Cutbank River	Abundant in fire-killed timber.
Malacosoma lutescens (N. & D.)	Shrubs	South-central Alberta	Sizeable infestations at Elk Point, Two Hills, Wainwright, and Nordegg.
Malacosoma pluviale (Dyar)	Shrubs	Peace River, Grande Prairie	Localized heavy infestations.
Neodiprion spp.	Douglas fir, lodgepole pine, white spruce	Shaftsbury, and northeast of Edmonton	Severe defoliation on a few trees.
Orgyia antiqua (Linn.)	Apple, cotoneaster	Southern Alberta	Heavy in Calgary area.
Petrova spp.	Lodgepole pine	Widespread throughout province	Severe infestation on shelterbelt near Valleyview.
Pissodes engelmanni Hopk.	Engelmann, white, and black spruce	Common in forest areas	Sizeable infestations in Kootenay, Waterton, and Wood Buffalo National Parks, along Slave River, and in southern Alberta.
Pyralid sp.	Lodgepole pine	Southwestern Alberta, Cypress Hills	Common in galls of *Peridermium harknessii* J. P. Moore.


GREAT BEAR LAKE
FORT NORMAN
MACKENZIE RIVER
FORT SIMPSON
YELLOWKNIFE
GREAT SLAVE LAKE
HAY RIVER
FORT SMITH
SLAVE R.
LAKE ATHABASKA
HAY RIVER
PEACE RIVER
FORT VERMILION
A L B E R T A
PEACE RIVER
ATHABASKA R.
EDMONTON
NORTH SASKATCHEWAN R.
RED DEER
CALGARY
S. SASKATCHEWAN R.
LETHBRIDGE
CALGARY LABORATORY
FOREST INSECT SURVEY 1961
LOCATION OF POINTS WHERE
SPRUCE BUDWORM INFESTATIONS
WERE DETERMINED BY GROUND OR AERIAL SURVEYS
● SEVERE ◒ MODERATE ○ LIGHT
0 100 200


GREAT BEAR LAKE
FORT NORMAN
YELLOWKNIFE
MACKENZIE RIVER
FORT SIMPSON
LIARD RIVER
GREAT SLAVE LAKE
HAY RIVER
FORT SMITH
SLAVE R.
LAKE ATHABASKA
PEACE RIVER
FORT VERMILION
A L B E R T A
PEACE RIVER
ATHABASCA R.
NORTH SASKATCHEWAN R.
RED DEER
CALGARY
S. SASKATCHEWAN R.
LETHBRIDGE
CALGARY LABORATORY
FOREST INSECT SURVEY 1961
LOCATION OF POINTS WHERE
LARCH SAWFLY
INFESTATIONS
WERE DETERMINED BY
GROUND OR AERIAL SURVEYS
SEVERE
MODERATE
LIGHT
0
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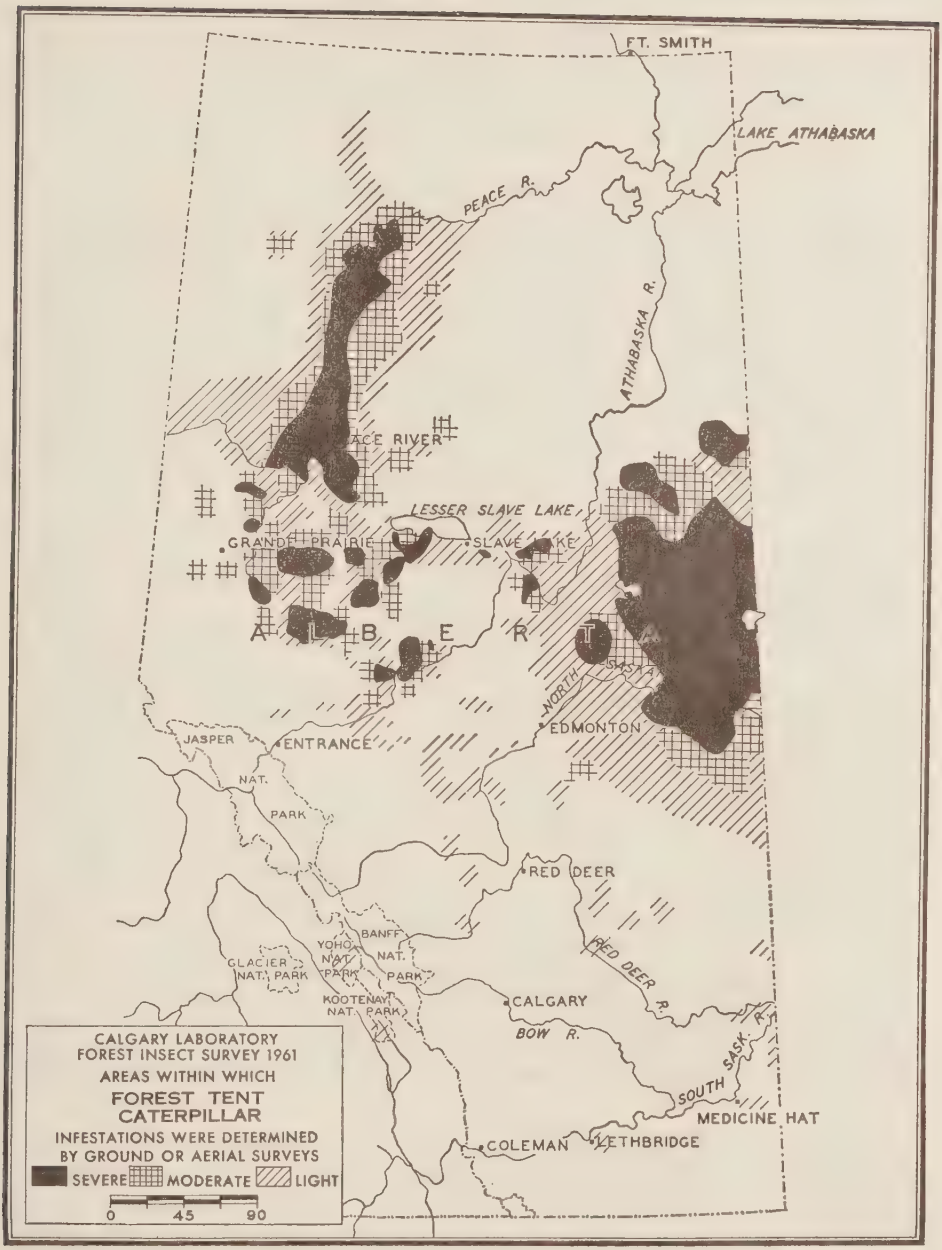
FT. SMITH
LAKE ATHABASKA
PEACE R.
ATHABASKA R.
PEACE RIVER
LESSER SLAVE LAKE
GRAND PRAIRIE
SLAVE LAKE
ALBERTA
NORTH SASK.
EDMONTON
JASPER
ENTRANCE
NAT.
PARK
RED DEER
BANFF
YOHO NAT. PARK
GLACIER NAT. PARK
KOOTENAY NAT. PARK
CALGARY
BOW R.
RED DEER R.
SOUTH SASK. R.
MEDICINE HAT
COLEMAN
LETHBRIDGE
CALGARY LABORATORY
FOREST INSECT SURVEY 1961
AREAS WITHIN WHICH
FOREST TENT CATERPILLAR
INFESTATIONS WERE DETERMINED BY GROUND OR AERIAL SURVEYS
SEVERE
MODERATE
LIGHT
0
45
90

PROVINCE OF ALBERTA

FOREST DISEASE SURVEY

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INTRODUCTION

Temperatures in the shelterbelt area of the Province were extremely high during June, July, and August, and a new record low temperature was recorded in central Alberta in September. Precipitation was normal in the mountains and foothills, but in the Peace River district June precipitation was the heaviest recorded in Canada. The growing season was normal.

Disease survey activities in the region were intensified during 1961. Damage appraisal studies of dwarf mistletoe were carried out in lodgepole pine stands of different age classes, and on different sites. New sample plot methods were introduced to observe the spread and intensification of the important diseases. Twelve re-examinations of previously reported outbreaks were made on this basis. Intensive detection work on the alternate hosts of the rust fungi resulted in many new herbarium, host, and distribution records.

Surveys to determine the amount of cull in lodgepole and hybrid pines were completed in cooperation with the Alberta Department of Lands and Forests. A total of 1,250 trees were sampled in the Clear Hills and along the eastern slopes of the Rocky Mountains.

In 1961, 4,022 collections were processed, 712 were disease specimens and 3,310 were cultures of wood-rotting fungi. Identifications have been made of 619 disease specimens, and 51 were discarded as unidentifiable. Of the 3,310 cultures, 1,129 were identified and 834 have been discarded because they produced no growth. Forty-two disease specimens and 1,347 cultures of wood-rotting fungi remain unidentified at the time of writing. A summary of the collections from the different hosts follows:

Coniferous Trees	Collections	
Pine		
Lodgepole pine	2,652	
Hybrid pine	599	
Jack pine	47	
Limber pine	9	
Other pines	6	
		3,313
Spruce		
White spruce	351	
Engelmann spruce	5	
Black spruce	23	
Other spruces	16	
		395
Fir		
Alpine	19	
Balsam fir	8	
Other firs	1	
		28
Douglas fir	18	
Juniper	5	
Larch	5	
Other conifers	3	
Total	3,767	

Broad-leaved Trees	Collections	
Poplar		
Trembling aspen	61	
Balsam poplar	20	
Other poplars	5	
		86
Birch		
White birch	8	
Other birches	10	
		18
Alder		7
Willow		24
Total		135

Miscellaneous	120
Grand Total	4,022

Atropellis Canker of Pine—Data collected over the last 7 years indicated that the disease of lodgepole pine (*Pinus contorta* Dougl.) caused by *Atropellis piniphila* (Weir) Lohman and Cash, was widespread from the Waterton Lakes and Cypress Hills, north along the mountains to within 60 miles of Grande Prairie. The incidence of the infection was highly variable between stands. At several locations 100 per cent of the trees were infected with multiple stem cankers but in other stands cankers were rare. This disease has not yet been reported on jack pine (*Pinus banksiana* Lamb.).

Dwarf Mistletoe of Pine, *Arceuthobium americanum* Nutt. ex Engelm.—Growth reduction and tree mortality caused by dwarf mistletoe was measured in 8 infected stands of lodgepole pine. These stands were composed of 6 different age classes and occurred on 2 different sites. Four infection classes: healthy, lightly-infected, moderately-infected, and heavily-infected, were used to evaluate the effects of the disease. Differences in volume between individual infection classes were not statistically significant, although a significant difference was detected between the extreme classes. It was found that the growth loss increased with infection age. Height growth of the trees was markedly influenced by mistletoe attack. The effect on tree form was less pronounced, although heavily infected trees were thicker at the base and tapered faster than the healthy trees. The number of dead trees and the number of trees infected seemed directly related to stand age and there was a significant difference in mortality between dry and moist sites.

Fungus parasites of dwarf mistletoe were reported from 6 locations. *Wallrothiella arceuthobii* (Pk.) Sacc. was reported mainly from the Lac La Biche district, and *Septogloeum gillii* Ellis from the Dutch Creek and Kananaskis areas. A high percentage of the mistletoe seed crop was destroyed by *Septogloeum* in both areas. Similar heavy damage has not yet been reported since 1953 when it occurred in the Kananaskis area.

Needle Casts —Needle casts of lodgepole pine were reported from 22 localities, but did not reach epidemic levels in 1961. The known distribution record of *Hypodermella montana* Darker, on lodgepole pine, was extended to immediately north of the Simonette Fire Tower. A report of the same fungus on hybrid pine (*Pinus contorta* X *Pinus banksiana*) from Kinuso is the first herbarium record on this host.

Rhabdocline pseudotsugae Syd., needle cast of Douglas fir (*Pseudotsuga menziesii* (Mirb.), Franco) was found for the first time in the Porcupine Hills. This report in conjunction with previous records indicates that the disease is present throughout the range of the host in Alberta.

Three new herbarium records of needle cast fungi were made in 1961. These were: *Hypodermella abietis-concoloris* (Mayr) Dearness, on alpine fir (*Abies lasiocarpa* (Hook.) Nutt.) from Waterton Lakes National Park and Kananaskis; *H. mirabilis* Darker, on balsam fir (*A. balsamea* (L.) Mill.) from Wadlin Lake; and *Bifusella crepidiformis* Darker, on white spruce (*Picea glauca* (Moench) Voss) from 4 locations between Elbow Falls and Grande Prairie.

Rusts —A high incidence of *Cronartium ribicola* J. C. Fischer was reported on limber pine (*Pinus flexilis* James) from Hillcrest, Coleman, and Mount Bertha. Seventy-five to 100 per cent of the trees were infected in an area of 2 square miles. *Peridermium harknessii* J. P. Moore was found on hybrid pine over several square miles in the Clear Hills, where up to 90 per cent of the trees were infected. Some trees of pole size had as many as 6 stem galls. Collections of *Cronartium comandrae* Peck on the pine hosts from the Cypress Hills, Cold Lake, and Yellowknife, extended the known distribution of the disease. An increased

effort to find the stem rusts on their alternate hosts yielded many new herbarium records. *Cronartium coleosporioides* Arth. on *Castilleja miniata* Dougl. was found in 7 different locations from Kananaskis north to Grande Prairie. *Cronartium comandrae* Peck on *Comandra pallida* A. DC. and on *Geocaulon lividum* (Richards) Fern. was found from the Cypress Hills north to Ronald Lake, in northeastern Alberta.

The needle rusts, *Chrysomyxa ledi* de Bary and *C. ledicola* Lagerh., were observed on white and black spruce at the 23 locations shown on the accompanying map, and at Nahanni River and Yohin River in the Northwest Territories. *Coleosporium solidaginis* Thuem. on lodgepole pine was observed in the Porcupine Hills for the first time. The occurrence of this rust on *Solidago* sp. was also noted in Alberta for the first time.

Spruce cone rust, *Chrysomyxa pirolata* Wint. was widespread on white spruce (See accompanying map). Twenty-eight collections were obtained from spruce and 3 from *Pyrola* sp. This disease was epidemic at Bragg Creek where 75 per cent of the cones were damaged and in the Cypress Hills where 25 per cent of the cones were attacked. The collection of *C. pirolata* from black spruce at Cutbank River, south of Grande Prairie, formed a new herbarium host record. *Melampsorella caryophyllacearum* Schroet. was again reported on balsam and alpine fir at widely spaced locations.

Drought—The drought reported in the mountains and foothills in 1960 caused considerable damage on drier sites, but there was no evidence of secondary disease agents in this area in 1961. Considerable drought damage was observed on white spruce and poplars in prairie shelterbelts. The mean temperature in these areas was four to six degrees higher than normal during June, July, and August. Precipitation for the same period was very low.

Rabbit Damage—Rabbit damage was very evident along the Mackenzie Highway for about 125 miles north of Mile 220. All tree species were attacked but jack pine suffered the most damage. Young trees up to one inch in diameter were chewed off and larger trees were completely girdled. Light damage was reported from many other localities.

High Water Table—Water tables were higher than normal in the sandy region from Bitumont north to Embarras on both sides of the Athabasca River in 1961. Total precipitation recorded at Embarras Airport for the period, May 1959 to April 1961, was six inches above a 15-year average. This wet cycle was preceded by two abnormally dry years, with precipitation approximately seven inches below average.

In low areas jack pine and white birch (*Betula papyrifera* Marsh.) stands, 15 to 20 years old, were killed. Roots of these trees were flooded by the abnormally high water table. However, stands on the sandy slopes and ridges were suffering moisture deficiency. Both of these conditions and a species of tube-making insect contributed to the reddening of the pine foliage in this area. (See Forest Insect Survey portion of this Report.)

A Condition of Pine—Unhealthy lodgepole pines in the Whitecourt district were reported in 1960. During 1961 these stands were carefully examined. Soil pits did not disclose any irregularities and pH values were normal. Excavated root systems showed normal root mortality. Only the foliage of the last two years remained on the branches. These needles were discoloured with small yellow spots of unknown origin. Annual ring measurements showed a sudden growth reduction commencing four years ago. This date corresponds with gas well drilling activities in the surrounding area. Further investigation is necessary to determine whether air pollution is responsible for this condition.

OTHER NOTEWORTHY DISEASES

Host	Organism	Locality	Remarks
Alder, sp.....	*Cryptodiaporthe oxystoma* (Rehm) Urban	Blackstone River and Liard River, N.W.T.	New herbarium record.
Ash, mountain.....	*Erwinia amylovora* (Burrill) Winslow et al.	Calgary, Alta.	Fire blight, much more prevalent on shade trees in the Calgary region than in previous years.
Aspen, trembling.....	*Marssonina tremuloidis* (Ell. & Ev.) Kleb.	16 mi. north of Fort Providence, N.W.T.	Major range extension northward.
	Pleurotus ostreatus Jacq. ex Fr.	Waterton Lakes, National Park, Alta.	Fruiting bodies, new herbarium record.
	Sclerotium sp.	Alberta region	Further reduction in the occurrence of the aspen tar spot was noted in 1961.
Bearberry, alpine.....	*Pucciniastrum sparsum* (Wint.) Fischer	Peyto Lake, Banff National Park, Alta.	New record for Alberta.
Birch, white.....	*Fomes fomentarius* (L. ex Fr.) Kickx	Blackwater River N.W.T.	Herbarium records extended northward.
	Winter damage	Calgary, Alta.	Severe top-killing of birches was evident in the spring of 1961.
Conifers.....	"Red belt"	Franklin Mountains, N. of Wrigley, N.W.T. Nahanni River at Jack Fish Creek, N.W.T.	First herbarium records of this disease from N.W.T.
Cottonwood, black.....	*Melampsora occidentalis* Jacks.	Athabasca Falls, Jasper National Park, Alta.	New herbarium record on this host.
Elm, american.....	*Tubercularis vulgaris* Tode	Fort Saskatchewan, Alta.	New herbarium record.
Fir, alpine.....	*Echinodontium tinctorium* Ell. & Ev.	Waskahigan River, Alta.	Herbarium records extended northward.
Fir, balsam.....	*Melampsora epitea* Thuem.	Grovedale, Alta.	New herbarium record on this host.
	Pucciniastrum epilobii Otth	Grovedale, Alta.	Herbarium records extended northward.
Juniper, Rocky mountain	*Gymnosporangium nelsoni* Arth.	Brooks, Alta.	New herbarium record on this host.
Larch, eastern.....	*Melampsora paradoxa* Diet. & Holw.	16 mi. north of Grimshaw, Alta.	New herbarium record on this host.
Pine, lodgepole.....	"Red belt"	Porcupine Hills, Alta.	Damage restricted to this area.
Pine, jack.....	*Armillaria mellea* (Vahl ex Fr.) Quél.	Truman, Alta.	Herbarium records extended northeastward.
	Peniophora pseudo-pini Weres. & Gibson	47 mi. north of Lac La Biche, Alta.	Herbarium records extended northeastward.
Pine, whitebark.....	*Neopeckia coulteri* (Pk.) Sacc.	Crowsnest Mtn., Alta.	New herbarium record on this host.
Serviceberry.....	*Gymnosporangium clavipes* (Cke. & Pk.) Cke. & Pk.	Kananaskis, Alta.	New herbarium record.
	Gymnosporangium corniculans Kern	Cypress Hills, Alta.	New record for Alberta.
	Gymnosporangium nelsoni Arth.	Cypress Hills, Alta.	First herbarium record from the Cypress Hills.
Spruce, black.....	*Chrysomyxa arctostaphyli* Diet.	Blackwater River, N.W.T.	Herbarium records extended far northward.
	Retinocyclus abietis (Crouan) Groves & Wells	Rocky Mountain House, Alta.	New herbarium record on this host.
Spruce, Englemann.....	*Cytospora curreyi* Sacc.	Panther Creek, Banff National Park, Alta.	New herbarium record on this host.
Spruce, white.....	Drought	Provincial tree nursery, Edmonton Alta.	Browning of foliage observed in midsummer.
	Retinocyclus abietis (Crouan) Groves & Wells	Blackstone and Liard Rivers, N.W.T.	Herbarium records extended far northward.
Wintergreen	*Pucciniastrum pyrolae* Diet. ex Arth.	Cypress Hills, Alta.	New herbarium record.

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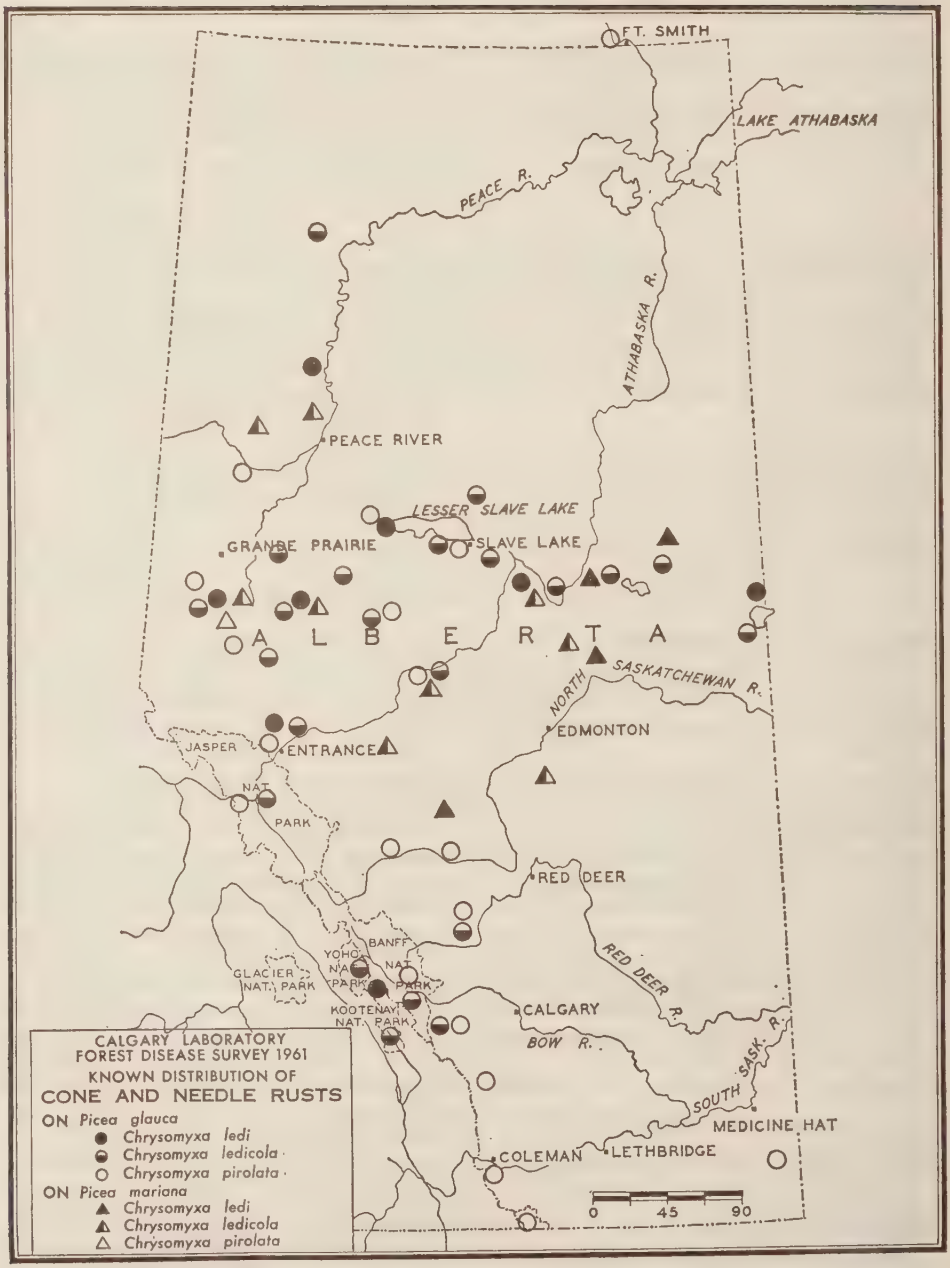
FT. SMITH
LAKE ATHABASKA
PEACE R.
ATHABASKA R.
PEACE RIVER
LESSER SLAVE LAKE
GRANDE PRAIRIE
SLAVE LAKE
ALBERTA
NORTH SASKATCHEWAN R.
EDMONTON
JASPER
ENTRANCE
NAT.
PARK
RED DEER
BANFF
YOHO NAT. PARK
GLACIER NAT. PARK
KOOTENAY NAT. PARK
RED DEER R.
CALGARY
BOW R.
SOUTH SASK. R.
MEDICINE HAT
COLEMAN
LETHBRIDGE
0 45 90
CALGARY LABORATORY
FOREST DISEASE SURVEY 1961
KNOWN DISTRIBUTION OF
CONE AND NEEDLE RUSTS
ON Picea glauca
Chrysomyxa ledi
Chrysomyxa ledicola
Chrysomyxa pirolata
ON Picea mariana
Chrysomyxa ledi
Chrysomyxa ledicola
Chrysomyxa pirolata

PROVINCE OF BRITISH COLUMBIA

FOREST INSECT SURVEY

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INTRODUCTION

Outbreaks of defoliating insects declined in coastal areas, but increased in the Interior in 1961. The outbreak of the saddle-backed looper at Kitimat subsided throughout the 10,500 acres of timber which were sprayed in 1961. Parasites and diseases are believed capable of reducing residual numbers which persist in a relatively small area. The infestations of the green-striped forest looper on the west coast of Vancouver Island also declined in 1961. About 1,500 acres of Douglas fir in the lower Cameron River Valley were sprayed to control pine butterfly; egg counts indicate that there will be no serious defoliation anywhere on Vancouver Island in 1962. Except in a few localities, population of the two-year cycle spruce budworm in central British Columbia declined to a low level. The one-year cycle spruce budworm caused heavy defoliation at Kitimat, and a further increase is expected in 1962. The black-headed budworm remained at a low level of abundance throughout the Province.

An outbreak of the Douglas-fir tussock moth occurred in the north Okanagan Valley and the forest tent caterpillar occurred in epidemic numbers in portions of the Nelson, Prince George, and the Prince Rupert Forest districts in the Interior.

The known range of the balsam woolly aphid increased again in 1961, and the predator release program was continued.

The large number of red-topped Douglas fir in 1960 indicated that attacks by the Douglas-fir beetle were increasing. This trend continued in 1961 and even heavier damage is expected in 1962.

The Victoria Laboratory received 2,969 insect collections and the Vernon sub-laboratory 2,846 for a total of 5,815. Collections received during 1961 were distributed among the principal tree species as follows:

Coniferous trees	Collections	
Douglas fir		998
Hemlock		
Western hemlock	955	
Mountain hemlock	8	
Miscellaneous hemlock	5	
		968
Spruce		
White spruce	330	
Engelmann spruce	179	
Sitka spruce	213	
Black spruce	30	
Miscellaneous spruce	24	
		776
Pine		
Lodgepole pine	320	
Ponderosa pine	124	
Western white pine	56	
Miscellaneous pines	11	
		511
Fir		
Alpine fir	202	
Amabilis fir	134	
Grand fir	37	
		373

Broad-leaved trees	Collections	
Poplar		
Trembling aspen	224	
Black cottonwood	81	
Silver poplar	16	
Balsam poplar	12	
Lombardy poplar	2	
Miscellaneous poplar	19	
		354
Alder		
Red alder	75	
Sitka alder	6	
Mountain alder	50	
Miscellaneous alder	55	
		186
Birch		
White birch	48	
Dwarf birch	21	
Water birch	5	
Miscellaneous birch	49	
		123

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Coniferous trees		Collections	Broad-leaved trees	Collections
Western red cedar		151	Willow	298
Larch			Garry oak	110
Western larch	50		Cherry	36
Tamarack	6		Maple	33
European larch	2		Dogwood	23
Miscellaneous larch	2		Ash	10
		60	Arbutus	9
Juniper			Elder	9
Rocky Mountain juniper	31		Cascara	8
Common juniper	8		Apple	7
Miscellaneous juniper	4		Hazelnut	6
		43	Hawthorn	3
Miscellaneous coniferous trees		10	Miscellaneous broad-leaved trees	4
Total		3,890	Total	1,219
Miscellaneous hosts and light trap collections				706
GRAND TOTAL				5,815

IMPORTANT INSECTS

Spruce Budworm, *Choristoneura fumiferana* (Clem.)—The one-year-cycle spruce budworm showed a small increase in the Douglas-fir stands of Kamloops and Nelson Forest districts except in the Lillooet area. Larvae were not numerous enough to cause noticeable defoliation. The moderate infestation between Mileages 490 and 540 on the Alaska Highway persisted and an analysis of egg counts indicates that the infestation will continue in 1962.

The spruce budworm outbreak in the Kitimat area continued and defoliation extended from south of Bish Creek on Kitimat Arm north to Lakelse Lake. Feeding within this area was mostly light, but tree tops and branch tips were heavily defoliated near Service Centre and north to the Little Wedeene River. Similar conditions prevailed on the south side of the Wedeene River, and along Coldwater Creek. Egg counts indicate that defoliation will be light to moderate in 1962 with the exception of a small area north of Service Centre where heavier defoliation is expected. The largest egg counts, 356 egg masses per 100 square feet of foliage surface, were from Service Centre and within an area sprayed with DDT in 1961. Elsewhere in the coastal districts populations of the one-year-cycle spruce budworm remained at a low level.

There was a slight decline in the two-year-cycle spruce budworm populations in the Prince George Forest District. Although noticeable defoliation will recur in 1962, it will probably be lighter in most alpine fir and spruce stands than it was in 1960. There was up to 15 per cent defoliation of the 1961 growth on alpine fir in Jamieson Creek Valley, Kamloops Forest District.

The average number of larvae per square foot of foliage surface decreased significantly in 10 out of 12 plots in the Babine Lake region of the Prince Rupert Forest District. The percentage of tips infested also decreased in 11 out of 12 plots. Defoliation in 1962 should be light in most areas, but heavy defoliation can be expected along the Suskwa River Trail and along the Cronin Mine Road where the populations increased locally.

Although defoliation has been severe in the Babine Lake infestation many trees are putting out large numbers of adventitious buds. This indication of tree recovery along with an over-all decrease in budworm population suggests that the imminent danger of heavy tree killing may be passed although some tree mortality and heavy top-kill is expected to occur in several areas. Collections: Coast 119, Interior 129.

Saddle-backed Looper, *Ectropis crepuscularia* Schiff.—About 10,500 acres of timber west of the smeltersite and townsite at Kitimat were sprayed between June 22 and July 12, 1961. Dosage was ½ pound of DDT in two U.S. gallons of fuel oil per acre, applied by helicopter. Insect mortality was estimated

at approximately 90 per cent. The control operation was successful in reducing defoliation to a minimum, thus preventing almost certain death of a large proportion of the overstory hemlock within the area.

The extent of the infestation, as determined by aerial and ground surveys in September was slightly over 16,000 acres, an increase of several thousand acres compared with 1960. The increase in area resulted from an extension northward to the Little Wedeene River, and southward along Kitimat Arm almost to Bish Creek.

The number of pupae was extremely low throughout the sprayed area, where only one pupa was found in 90 one-square-foot duff samples; comparable samples in 1960 averaged 7.8 pupae per square foot. Only at two points did the number of pupae exceed one per square foot. Both of these were at the southern end of the infestation. The largest population was found along Kitimat Arm outside the spray zone where pupae averaged 9.0 per square foot.

The large reduction in pupal counts within the sprayed area cannot be wholly attributed to the insecticide. Parasitism and virus disease killed a large proportion of the larvae that survived the spray. A large hymenopterous parasite, *Dusona pilosa* (Walley), which emerges from the last instar larvae and overwinters in the duff as a cocoon, was particularly numerous. In addition, over 50 per cent of the pupae were parasitized by other species.

Tree mortality was exceptionally heavy among the suppressed and intermediate crown classes, amounting to 100 per cent kill of hemlock and balsam over large areas. Mortality of dominant and co-dominant trees was lighter except for local pockets. A large proportion of the heavily defoliated area is believed to have suffered mortality similar to Anderson Creek where up to two-thirds of the basal area of hemlock was killed. Preliminary figures indicate that losses may reach as high as 10,000 bd. ft. per acre. Many trees still living have lost up to 95 per cent of their total foliage. Salvage operations are being planned to recover not only the trees killed by the saddle-backed looper, but as much of the amabilis fir as possible which has been killed by balsam bark beetles. The amabilis fir was also being heavily defoliated by spruce budworm.

Chemical control is not recommended for the saddle-backed looper in 1962. The large pupal population is restricted to Kitimat Arm and the total extent of this area is only about 1,500 acres. Parasites, along with disease, are believed to be numerous enough to reduce the population to a low level in 1962.

Numbers remained low elsewhere in the Province. Collection: Coast 60, Interior 103.

Black-headed Budworm, *Acleris variana* (Fern.)—The black-headed budworm increased in the Kitimat River Valley in 1961. The largest collection, 97 larvae per sample, was taken at Hirsch Creek, and over 30 larvae per sample were collected at Kitimat, Nalbeelah Creek, and in the Zymoetz River Valley. Egg counts indicate that light defoliation can be expected at Hirsch Creek in 1962.

The population decreased to low levels in the Queen Charlotte Islands. The largest collection, 36 larvae, was made at Tow Hill on Graham Island. Only small numbers of larvae were collected throughout the remainder of the Islands. The number of insects was too small to warrant an egg survey.

The black-headed budworm population remained low throughout the remainder of the coastal region and the Interior. Collections: Coast 105, Interior 34.

Balsam Woolly Aphid, *Adelges piceae* (Ratz.)—The presence of the balsam woolly aphid in the Indian River Valley was confirmed in 1961, again extending the known range of the insect. The presence of the aphid is suspected at Raffuse Creek and Alouette Lake which are respectively north and east of the known area of infestation. Although samples from these areas showed symptoms of gout and there was evidence of some "rotholz" which suggests that the

trees have been infested, no specimens of *A. piceae* were found but occasional specimens of another adelgid were present. It is difficult to establish the presence of balsam woolly aphid in these stands as stem attacks are very rare and trees must be felled to collect branch samples.

An aerial survey on August 18 extended over the entire region. A total of 8,300 dead trees was counted in all watersheds, compared with the 5,300 trees counted in 1960. The heaviest tree mortality was noted at Cypress Creek, along the Seymour River, and in the Indian River Valley. Over 200 dead trees were recorded at Rainy River, Woodfibre Creek, Mill Creek, Capilano River, and along Coquitlam Lake.

Two shipments of *Laricobius erichsonii* Rosenh. and one shipment of *Aphidecta obliterata* L. were released on Seymour Mountain in 1961. Several *L. erichsonii* adults were observed feeding on *Adelges* on August 9, 1961, on one of the trees on which specimens had been released on May 24. Three adult *Pullus impexus* Muls. were found on June 15 on a tree close to where this species was released in 1960. This is the first indication that any of the predators released in 1960 survived the winter.

Douglas-fir Beetle, *Dendroctonus pseudotsugae* Hopk.—Unusually arid conditions in 1961 caused many of the currently attacked trees to discolour and in some cases to drop their needles by the end of August. It is apparent that infestations are again numerous and widespread in the Interior. Counts of infested trees in areas of greatest attack were as follows: Aspen Grove to Princeton—230, Falkland to Monte Lake—270, Monte Hills—600, Tranquille Creek—675, Arrowstone Hills—650, Campbell Range—525, Cache Creek—2,220, Clinton to 70-Mile—1,430, 100-Mile—2,290, Lac la Hache—1,360, Williams Lake north—2,540, and Farwell Creek—400.

Kelowna Saw-mills carried out a trap tree program in a moderately infested timber sale at Bear Creek. Groups of 10 mature Douglas-fir trees were felled in each of four locations. The trap trees absorbed a heavy population of Douglas-fir beetles. These trap trees were removed from the forest during July and milled. Stumps of infested trees and infested cull logs were sprayed with ethylene dibromide to kill the remaining beetle broods. Boundary Sawmills Ltd. also carried out a trap tree program in Nelson Forest District, but the results have not yet been assessed.

The Douglas-fir beetle continued to infest trees in small numbers throughout most of the South Vancouver District. Over 200 attacked trees were counted along the Nahatlatch River, and 40 green attacked trees were found near Boston Bar near several logging operations where slash and right-of-way logs were heavily infested. Light attacks continued in the Skagit River watershed where trees on six strips were tallied as follows: green and free from attack—1,028, green infested—6, red-topped—4, old grey—192.

A large number of red-topped Douglas fir trees were observed along Buttle Lake on Vancouver Island. Ground surveys revealed that small fires were responsible for some of the dead trees, but tree diseases and bark beetles were active in the stands. A 1 x 10 chain strip through Douglas fir ranging in diameter from 12 to 72 inches showed that of 66 trees only 29 were green, 20 grey and dead, three were red-topped, and 14 were snags. Three green trees were infested with Douglas-fir beetle, and seven green trees were infected with *Polyporus schweinitzii* Fr.

Mountain Pine Beetle, *Dendroctonus monticolae* Hopk.—In the Interior, mountain pine beetle infestations persisted at widely scattered localities, chiefly in white and lodgepole pines. In the Nelson Forest District beetles were active in white pine along Fosthall Creek where they have persisted for some time. Infestations in lodgepole pine expanded at Elk and Coyote creeks and along the Upper West Kettle Valley. Some 75 freshly attacked lodgepole pine were discovered at Parson. At Bush River an outbreak which began some years ago

in large white pine trees along the valley bottom has gradually worked up the valley slopes where it is now active in white and lodgepole pines of smaller diameter (12 inches and less).

In the Kamloops Forest District there was an increase in mountain pine beetle attack at North Barriere and Adams lakes where 520 mature white pine have been killed in the last few years. An immature stand of western white pine in the Upper Shuswap River Valley appears to be doomed by the combined attack of mountain pine beetle and pole blight. Other noteworthy infestations in white pine are: Perry River Valley, Skagit River drainage and Mabel Lake.

The mountain pine beetle persists in lodgepole pine trees about Takla Lake in the Prince George District, and in the Monte Hills and Hayes Creek regions of the Kamloops Forest District.

Approximately 440 dead white pine were counted around Birkenhead Lake in trees ranging from 12 to 30 inches in diameter. White pine blister rust and pole blight are also prevalent in this region. Ninety red-topped white pine were found at Gray Creek on the south end of Sechelt Inlet. Beetle attacks on white pine continued on Vancouver Island but no counts were made in 1961.

Engelmann Spruce Beetle, *Dendroctonus engelmanni* Hopk.—Many of the overmature spruce at Lightning Lake, Manning Park, have been killed by the spruce beetle during the past four years. A light infestation persists in standing trees up to 44 inches in diameter. A local infestation on Hampton Creek has subsided. Generally in the Interior the spruce beetles occurred in small numbers in blowdowns or in the occasional deck of spruce logs. A small number of green-infested spruce was found at the eastern end of Taltapin Lake. Logging has been in progress in the immediate vicinity.

Alaska Spruce Beetle, *Dendroctonus borealis* Hopk.—Light scattered attacks by the Alaska spruce beetle were observed in standing white spruce trees between Miles 918 and 1,093 on the Alaska Highway and at Mile 5 on the Mayo Road, Yukon Territory.

Bark Beetles in Ponderosa Pine, *Dendroctonus* spp.—Red-topped mature ponderosa pine, singly or in groups of up to 10 trees were observed in many localities about Princeton. The majority of infested trees in the Kentucky Lake, Allison Lake, Tulameen and Coalmont areas contained *D. brevicomis* Lec. Northwest of Princeton, *D. monticolae* appeared to have been the primary attacker although *D. brevicomis* was also present in some trees. Several dozen ponderosa pine trees 8 to 12 inches in diameter were severely attacked by *D. valens* Lec. on the Little Shuswap Indian Reserve. An estimated 2,300 immature ponderosa pine north of Chapperon Lake were killed by *Ips* sp. associated with *D. monticolae*. About 40 ponderosa pine at Fly Creek east of 70 Mile House recently have been killed by *D. monticolae*; and another 33 trees are infested.

Lodgepole Pine Beetle, *Dendroctonus murrayanae* Hopk.—This bark beetle continued to cause scattered light tree mortality among the lodgepole pine trees on Annie Lake Road and the fairways of the adjacent golf course and along the Mayo Road, Yukon Territory. The engraver beetle, *Ips latidens* (Lec.) was associated with the lodgepole pine beetle.

Ambrosia Beetles, *Trypodendron lineatum* (Oliv.)—Decked Douglas-fir, Engelmann spruce, and western hemlock logs were moderately to severely attacked at two localities near Malakwa. Severe ambrosia beetle infestations occurred in decked spruce logs at Froth Creek and northwest of Thunder River, and at Grizzly Lake, 12 miles northwest of Clearwater. The first attack at Froth Creek apparently was in the last week of April. The next wave of attack, much greater than the first, began about May 14. Damage to five million board feet of decked sawlogs by the second flight of beetles was substantially reduced by an application of a spray of benzene hexachloride in mid May.

Hemlock and white pine logs in the Cranberry Creek area were heavily infested by ambrosia beetles.

On the Coast over 70 million board feet of boomed logs were treated with BHC applied by helicopter to prevent damage by ambrosia beetles.

Western Balsam Bark Beetle, *Dryocoetes confusus* Sw.—A widespread *Dryocoetes* population is active on the plateau west of Okanagan Lake, from the vicinity of Bouleau Lake south to the headwaters of Shorts Creek. Alpine fir mortality appears to be increasing in this area, particularly near Bouleau Lake. Numerous groups of trees totalling some 400 "red tops" were counted but dead "grey-tops" were comparatively scarce.

Aerial surveys revealed several unreported infestations of *Dryocoetes* in Kamloops Forest District. Approximately 60 per cent of the alpine fir has been killed over six square miles at elevations of 4,000 to 5,500 feet along the north slope of Hunters Range. Scattered groups of infested trees were seen above Sicamous Creek Valley, and 30 per cent of the alpine fir on a ridge southeast of Owlhead Creek were killed recently.

Scattered groups of dead and recently infested alpine fir are general over some 12 square miles along Cherry Ridge, at elevations of 4,000 to 5,500 feet. The fungus, *Ceratocystis* sp., is associated with most if not all of these infestations.

Dryocoetes also persists over thousands of acres of alpine fir in the Prince George Forest District notably at Trembleur River, O'We-ell Creek, Grostete Creek, and on the Hart Highway between Silver Sands and Pine Pass.

Balsam Bark Beetles, *Pseudohylesinus* spp.—Balsam trees throughout the saddle-backed looper infestation at Kitimat and northward to the Wedeene River are being attacked and killed by bark beetles. Red-topped trees are present throughout the entire area, and in some localities up to three trees per acre were killed in 1961. The average tree mortality was much less. The beetle population is apparently increasing, and with a large number of suitable amabilis fir trees being weakened by spruce budworm defoliation, tree mortality from beetle attack can be expected to increase in 1962.

Fir Engraver, *Scolytus ventralis* Lec.—The fir engraver beetle continued to kill grand fir from Sooke to Courtenay on the east coast of Vancouver Island. Dead trees were observed throughout this region, and groups of up to 20 "red tops" in several acres were not uncommon. Tallies of two plots established in mature grand fir in Copper Canyon indicate that attacks are continuing. Of 48 trees, four died, and seven had from 10 to 30 feet of the tops killed.

Western Cedar Bark Beetle, *Phloeosinus punctatus* Lec.—Populations of this beetle subsided in all districts in 1961. No tree mortality and no top kill was observed, although several reports of green-infested trees were received.

Poplar and Willow Borer, *Sternochetus lapathi* (L.)—Two noteworthy infestations occurred in the East Nelson District; 70 per cent of the willow clumps in the Moyie River Valley, and 60 per cent near Canuck Creek were infested. Other localities of lighter current attack are Morrissey, Fernie, Hosmer, and Elk River north of Sparwood. In the Kamloops Forest District numerous willows were killed at Barriere, Little Fort, and Avola in the North Thompson Valley. This is the first record of attacks north of Kamloops.

This borer continued to attack willow and poplar regeneration on Vancouver Island and on the southern mainland portion of the Vancouver Forest District. Ten per cent of the cottonwood under four inches d.b.h. and 39 per cent of the small willow in the Skagit River Valley were infested. Five per cent of *Populus* regeneration at the Western Tree Farm nursery at Sardis were attacked.

Willow and cottonwood regeneration near Terrace was infested in 1961 and willow trees up to four inches in diameter are being killed. This is believed to be

the first record of the poplar and willow borer in the West Prince Rupert District, although signs of old attack indicate that it has been present in this area for some time.

Sitka Spruce Weevil, *Pissodes sitchensis* Hopk.—Weevil attacks were general throughout the range of Sitka spruce with the exception of the Queen Charlotte Islands. In the Nitinat River Valley, the only area where specific observations were made, about 15 per cent of the trees over three feet high were attacked in 1961.

Douglas-fir Tussock Moth, *Orgyia pseudotsugata* (McD.)—The current Douglas-fir tussock moth epidemic is restricted to the Okanagan Valley; moderately to severely defoliated trees have been observed at a dozen points between Okanagan Landing and Armstrong. Infestations include single isolated trees, small open-grown stands around agricultural buildings, and compact stands of Douglas fir up to 20 acres in extent. Apparently the populations increased rapidly in 1960 at several points in the North Okanagan but discoloration did not appear until late in June 1961.

On each of the larger infestations a number of late-instar larvae and pupae were discovered moribund from polyhedrosis virus infection. Up to 12 per cent of the larvae and pupae in cocoons were infected on Number One Indian Reserve.

Egg counts indicate that there might be severe defoliation in some stands in 1962 in the North Okanagan. Collection: Interior 26.

Green-striped Forest Looper, *Melanolophia imitata* Wlk.—The outbreak of the green-striped forest looper, on the west coast of Vancouver Island, subsided. Early spring pupal surveys indicated that a large proportion of the pupae failed to survive the winter. A large number of dead pupae were infected by the fungus, *Cordyceps militaris* (Fr.) Link. The number of larvae per sample decreased in all localities within the outbreak areas, and generally throughout the entire Vancouver Forest District.

The decrease in population was particularly timely as defoliation in 1960 was actually more severe than was recorded during the fall survey of that year. Trees in areas where defoliation was recorded as light to medium had lost up to 70 per cent of their total foliage and top kill was general throughout the infestation areas. Tree mortality, mostly restricted to western hemlock, occurred from Nootka Sound north to Kyuquot Sound, and was heaviest at Villaverde Island, Port Eliza Inlet, McKay Cove, and Kashutl Inlet.

This looper was common in the Interior but caused no noticeable defoliation. Collections: Coast 220, Interior 210.

Pine Butterfly, *Neophasia menapia* F. & F.—Approximately 1,500 acres of mature and overmature Douglas fir in the lower Cameron River Valley were sprayed on June 16 and June 19, 1961, to prevent defoliation by the pine butterfly. The insecticide used was $\frac{1}{2}$ pound of DDT per gallon of fuel oil applied at the rate of one U.S. gallon per acre by a Bell helicopter. Although a considerable number of larvae continued to feed until pupation the spray was effective in keeping defoliation to a low level. Eggs in the spray area averaged 0.34 per square foot of foliage surface compared with 15.14 in 1960, a reduction of over 97 per cent.

The apparent reduction in population indicated by the egg counts cannot be wholly attributed to the spray. The number of eggs just outside the spray zone also decreased by 96 per cent, although a 25 per cent increase was found about four miles up the Cameron River. Eggs at Nanaimo River, where there was a noticeable larval population, were 92 per cent less than in 1960. Counts made at Nanaimo Lakes, Copper Canyon, and Northwest Bay were also lighter than expected. It is evident that the pine butterfly populations on Vancouver Island have decreased to a very low level, and no serious defoliation is expected in 1962. Collections: Coast 16.

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Western Hemlock Looper, *Lambdina fiscellaria lugubrosa* (Hlst.)—The population level of this potentially dangerous looper has fluctuated in the coastal forest for several years, but no infestations have developed. This species was again common in collections throughout most of the coastal region, but primarily in the Vancouver Forest District. Two potential outbreaks detected in the initial stages in 1960 failed to develop. A maximum of seven larvae per sample were collected at Dahlstrom Point where 52 were collected in 1960, and only four out of 34 samples in the Holberg Inlet area contained hemlock looper. Only small numbers of larvae were found at Powers River on Vancouver Island where egg counts in 1960 indicated a possible build-up. Larvae were common along the west coast of Vancouver Island but the largest collection was at Eliza Inlet where 13 larvae were taken in one sample. Egg counts made in October were very low. Larvae were found occasionally on the mainland portion of the District. The largest collection, 13, was taken in Stanley Park which was sprayed for this species in 1959.

The hemlock looper persisted at low population levels through much of the Interior south of Prince George. A pocket of western hemlock loopers associated with saddle-backed loopers caused noticeable defoliation of hemlock near Clemina in the North Thompson Valley. Collections: Coast 84, Interior 103.

Oak Looper, *Lambdina somniaria* (Hlst.)—This looper once again caused severe defoliation in a localized area in Victoria. Nearly all Garry oak trees in the area bounded by Douglas Street, Rogers Avenue, Quadra Street, and McKenzie Avenue were completely defoliated. Coniferous trees within this area were also severely defoliated. Mortality caused by parasites, disease, and starvation reduced the larval population and egg counts indicate that the population throughout the city will be much lighter in 1962. Collections: Coast 4.

Forest Tent Caterpillar, *Malacosoma disstria* Hbn.—Near Warfield some 100 acres of trembling aspen were severely defoliated; a recurrence may be expected in 1962.

The epidemic between Donald and Invermere expanded and severe defoliation occurred in discontinuous patches over an area 60 miles long and up to 10 miles wide. Egg counts indicate that severe defoliation of trembling aspen trees may recur in 1962.

The infestation near McBride, active since 1957, expanded in 1961. Severe defoliation occurred in a band 3 to 4 miles wide from McBride southeast some 60 miles to Valemount. Egg counts indicate that the infestation will be severe again in 1962, and extend into the Canoe River Valley south of Valemount.

An infestation covering 16 square miles appeared at Taylor in the Prince George Forest District.

The infestation in the Prince Rupert Forest District has spread considerably in all directions. Trembling aspen was almost completely defoliated along both sides of the Skeena River from Cedarvale almost to Smithers. The larvae also fed on willow and birch, and several Sitka spruce trees were severely defoliated. Egg counts made at Hazelton, Kispiox, Moricetown, and Smithers indicate that the infestation will continue in 1962.

This species, in association with *M. pluviale*, caused severe defoliation of deciduous trees in the lower Fraser River Valley, in Vancouver, and south towards the International border. This outbreak is expected to continue in 1962. Several acres of wild hawthorn at Port Alberni on Vancouver Island were completely defoliated. Collections: Coast 37, Interior 47.

Western Tent Caterpillar, *Malacosoma pluviale* (Dyar)—Populations of the western tent caterpillar increased from Qualicum to Campbell River; in the Saanich Peninsula, Vancouver Island; and in the Fraser River Valley.

There was an increase in numbers of this species in the southern Interior, particularly along the Big Bend Highway, and near Fort Steel and Wardner. Collections: Coast 17, Interior 21.

Silver-spotted Tiger Moth, *Halisidota argentata* Pack.—The population level of this insect increased for the third consecutive year. Increases in the number of webs, as determined by roadside counts, were noted on the southwestern portion of Vancouver Island, the Strait Islands, and on the mainland from Point Roberts to Powell River. The unsightly webs in Stanley Park caused the Park officials to spray Douglas-fir trees bordering walks and roads. Although parasitism was moderately high in some areas a further population increase is expected in 1962. Collections: Coast 100.

Satin Moth, *Stilpnotia salicis* (L.)—Following the population declines of 1959 and 1960, satin moth infestations on several species of poplars increased to moderate and severe proportions in the North Okanagan and the upper Nicola River Valleys. Severe defoliation may be expected in additional localities in these areas in 1962.

After an absence of one year satin moth populations increased in the southern coastal region. A small group of trembling aspen trees five miles north of Courtenay was completely defoliated, and a dozen silver poplar trees at Lewis Park, Courtenay, were 95 per cent defoliated. Single trees at three locations in Victoria were heavily infested. Satin moth larvae were common in the Fraser River Valley and a further increase in distribution and numbers is expected in 1962. Collections: Coast 12, Interior 11.

Cooley Spruce Gall Aphid, *Adelges cooleyi* (Gill.)—This aphid was present throughout much of the range of Douglas fir in 1961. The attacks were generally more sporadic than in 1960, being very heavy in localized areas and almost completely absent from other regions. Attacks on spruce were lighter than in 1960.

In 1960 *A. cooleyi* was reported as being present on the Queen Charlotte Islands. There is now considerable doubt as to the species involved since collections made in 1961 were identified as *Pineus similis* Gill., another aphid which forms a gall quite similar to *A. cooleyi*.

The Cooley spruce gall aphid was abundant on Douglas fir in the Kamloops Forest District and between MacAlister and Quesnel in the Prince George Forest District. Newly formed galls on spruce were common in much of the Interior.

Grey Forest Looper, *Caripeta divisata* Wlk.—Larval populations of the grey forest looper increased greatly east of Terrace along the Zymoetz River Valley. The outbreak extended up the Valley for about 20 miles, from the 2.5 mile point to the Kitnayakwa River, and at least five miles up the Clore River. The high populations were confined to the narrow valley and in places extended up the steep slopes only $\frac{1}{4}$ mile. Over 200 larvae per 3-tree beating sample were collected in the heaviest areas but the average defoliation did not exceed 25 per cent except for some understory trees which lost up to 80 per cent of their foliage. The preferred host was western hemlock.

Although this looper has never caused serious defoliation before in British Columbia the overwintering pupal population was sampled in October. Seventy-two 1-foot-square samples averaged only 0.19 pupae per sample, a number considered too low to represent a threat in 1962. Collections: Coast 177, Interior 114.

Conifer Sawflies, *Neodiprion* spp.—*Neodiprion* sawflies were numerous throughout the Vancouver Forest District but with the variability characteristic of this group. The outbreak which caused conspicuous defoliation of 600 acres of lodgepole pine at the north end of Chilliwack Lake in 1960 subsided. The

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heavy population on hemlock between Burnett and Angus creeks also decreased to a very low level. The only locality where they were found in appreciable numbers was on Garibaldi Mountain northeast of Cheakamus. Here, 915 larvae were collected in one sample from hemlock, and large numbers were observed on balsam. The old growth on hemlock was heavily defoliated; the current year's growth was untouched. The trees are not believed to be in any immediate danger.

High sawfly populations caused about 15 per cent defoliation of the current year's growth on lodgepole pine in a localized area between Port Clements and Tlell on Graham Island, Queen Charlotte Islands.

Populations of *Neodiprion* sawflies remained at a low level in the Interior in 1961. Collections: Coast 436, Interior 346.

Fall Webworm, *Hyphantria cunea* (Drury)—There was a small increase in the number of webs in Nelson Forest District and in some localities of East Kamloops District. Cherry, black cottonwood, and alder were the hosts most frequently attacked. A particularly striking infestation was observed in Mission Creek Valley, south of Rutland, where cottonwood trees up to 50 feet in height were completely defoliated and enveloped in webbing. There was a slight decrease in the webworm numbers in Central Kamloops District, and a slight increase along the Fraser River south of Lillooet.

The fall webworm was very conspicuous along most of the east side of Vancouver Island, throughout the lower Fraser River Valley, and along the coast as far north as Lund. The webs were extremely large, some up to six feet long, and in many places the small trees were completely covered. Alder, willow, and cherry were the preferred hosts. Collections: Coast 10, Interior 7.

Green Spruce Aphid, *Neomyzaphis abietina* Wlkr.—Defoliation of Sitka spruce by this aphid was exceptionally heavy in 1961. The heaviest outbreak occurred on the Queen Charlotte Islands where mature trees as well as regeneration on the eastern parts of Moresby and Graham islands were attacked. Many trees in the Sandspit—Skidegate Lake areas lost up to 90 per cent of their foliage. Severe defoliation of Sitka spruce also occurred in the Prince Rupert—Port Edward area. Damage was heaviest along tidewater and inland at low elevations.

Heavy defoliation was recorded in nearly all coastal regions of the Vancouver Forest District, and specifically in the following localities: lower Fraser River Valley, Vancouver, Courtenay, Texada Island, Cracroft Island, south side of Gilford Island, and along the south side of Knight Inlet from Protection Point to Prominent Point.

Aspen Leaf Miner, *Phyllocnistis populiella* Cham.—The spectacular aspen leaf miner epidemic persists throughout most of the Interior and much of the range of trembling aspen in Yukon Territory. The intensity of infestation increased sharply in the western portion of the Prince George Forest District, and in the eastern part of Nelson Forest District. There was a general population decline on the Alaska Highway and in the Yukon in 1960 and 1961.

Aspen leaf miners were common throughout much of the range of aspen in the Prince Rupert Forest District with up to 100 per cent of the leaves infested in some areas. Leaf-miners were also present on poplar regeneration at Sardis in the Fraser River Valley.

Pine Needle Scale, *Phenacaspis pinifoliae* (Fitch)—Infestations in ponderosa pine stands persisted at several localities in the Okanagan Valley including Penticton, West Summerland, Glenmore, Winfield, Carr's Landing and Vernon. It was fairly common on Douglas fir in the North Okanagan and on lodgepole pine and Douglas fir near Yahk.

Black Pine-leaf Scale, *Nuculaspis californica* (Col.)—This species persists on ponderosa pine in company with pine needle scale at Penticton and West Summerland in the Okanagan Valley, and along the southeastern part of Kootenay Lake.

Alder Sawfly, *Hemichroa crocea* (Fourc.)—An outbreak of the alder sawfly caused almost complete defoliation of alder on the north end of Louise Island between Mathers Creek and Carmichael Passage, and along the south shore of Cumshewa Inlet, Queen Charlotte Islands. No other outbreaks were reported on the coastal area.

Only one outbreak was reported in the Interior. Mountain alder in a 20-acre mixed deciduous stand at Winfield was severely defoliated by June 12. Collections: Coast 8, Interior 3.

Large Aspen Tortrix, *Choristoneura conflictana* (Wlk.)—The infestation in trembling aspen trees at Mileage 1,205 on the Alaska Highway collapsed in 1961; at Carmacks in the Yukon the numbers declined less abruptly.

A Birch Blotch Miner, *Lyonetia* sp.—A severe infestation was observed on western white birch in the valleys and on the lower slopes of mountains bordering the McLennan and Fraser rivers in South Prince George District, and southward for five miles along the Albreda River Valley. Birch trees from Bush River to Cummins River and at Trout Lake, Nelson Forest District, again were severely infested.

Douglas-fir Needle Miners, *Contarinia* spp.—Infestations persisted throughout much of the range of Douglas fir. Populations of *C. pseudotsugae* Condr. increased noticeably in the southern portions of Kamloops Forest District; severe infestations occurred close to Okanagan Lake at Okanagan Mission, on the lower slopes of Terrace Mountain, and near the mouth of Equesis Creek. This species caused noticeable discoloration in young open-grown Douglas-fir trees on the north side of Similkameen River between Hedley and Princeton.

In the Invermere Ranger District moderate to severe infestations occurred in Christmas tree stands at lower elevations from Brisco south to Fairmont.

C. constricta Condr. attacked 50 to 60 per cent of the current year's needles on fir trees near Larkin.

Rusty Tussock Moth, *Orgyia antiqua badia* (Hy. Ed.)—The high population of the rusty tussock moth on Drake Island in Quatsino Sound, Vancouver Island, receded in 1961. Intensive sampling in the area failed to produce a single larva, either on Drake Island or on the northern portion of Vancouver Island. Collections: Coast 24, Interior 21.

Douglas-fir Terminal Damage—Damage to Douglas-fir terminals on second growth trees continued over a large portion of Vancouver Island. The proportion of damage caused by *Dioryctria* sp. was very small. The lateral tips as well as the terminals appear to be severed mechanically. Up to 50 per cent of the 1960 leaders were damaged, but damage to 1961 leaders appeared lighter. The causal agent is unknown but squirrels and possibly grouse are suspected.

Spruce Tip Moth, *Zeiraphera* sp.—A spruce tip moth was relatively common in coastal British Columbia. Damage to Sitka spruce tips was very noticeable east of Gillies Bay on Texada Island, and along Kitimat Arm as far south as Emsley Cove where up to 100 per cent of the lateral buds were attacked on some trees. Infested trees were common between Kitimat and Terrace and the Exstew River. Very high populations were present on the Queen Charlotte Islands. Collections: Coast 28.

Sitka Spruce Terminal Damage—Damage to Sitka spruce terminals and laterals on trees up to 30 feet in height was again common on the Queen Charlotte Islands, but the incidence of attack was generally lighter than in 1960. Adults obtained from terminal buds were identified as *Zeiraphera* sp., but there is some doubt if they are the same species which attacked lateral shoots. In mid-May when the insects in the terminal buds had completed feeding, larvae in the lateral shoots were in the early instars. Material is being reared for positive identification.

Spruce Seedworm, *Laspeyresia youngana* Kft.—The white spruce cone crop was light in southern Yukon, but heavy in northern Yukon. In southern Yukon, 94 to 99 per cent of the cones were infested with seedworm and cecidomyiids were also common in the samples. White spruce cones at Smithers were heavily infested by several cone insects, the most numerous being *L. youngana.*

Leaf-Eating Beetles, Chrysomelidae—*Chrysomela alnicola* Brown defoliated alder for two miles along Doctor Creek, Nelson Forest District. *Gonioctena notmani* Schaeff. severely defoliated roadside willows for some eight miles along Bonanza Creek in the Yukon. Ten acres of trembling aspen trees near Whitehorse were lightly defoliated by *Gonioctena americana* Schaeff.

A Round-headed Borer, *Tetropium velutinum* Lec.—White spruce log decks in a few scattered localities of the West Prince George District were moderately to heavily infested with *Tetropium velutinum.* The most noteworthy infestation was at a millsite on the upper Parsnip River.

A Tip-boring Beetle, *Scolytus* sp.—Conspicuous although lightly dispersed flagging of western larch twigs has been recorded from McGinty Lake to Kimberley and Cranbrook, and south of Cranbrook along Joseph Creek Road. Adults were collected in the tips early in July.

Pine Needle Miner, *Zelleria haimbachi* Busck—A severe infestation covering 20 acres occurred in lodgepole pine regeneration at Yard Creek. Parasitism was high and it is predicted that the infestation will be greatly diminished in 1962. An epidemic appeared in 1961 near Evans Creek on the west side of Slocan Lake on immature pole-sized lodgepole pine.

Spruce Spider Mite, *Oligonychus ununguis* (Jacot)—A severe infestation of mites occurred on pole-sized and mature Douglas-fir trees from Okanagan Landing to Otter Bay on the east side of Okanagan Lake.

OTHER NOTEWORTHY INSECTS

Insect	Host	Locality	Remarks
Rhyacionia buoliana (Schiff.).....	Mugho pine	Kelowna	Two infested leaders and one pupal case. This is the first record in the Interior.
Pissodes terminalis Hopping.....	Lodgepole pine	Mile 1 Canol Rd. M 777 and 717 Alaska Highway	2 to 5 per cent terminals infested.
Nymphalis antiopa (L.).....	Willow, trembling aspen	Southern and central Interior	Localized patches of lightly to moderately defoliated trees.
Nepytia sp.....	Douglas fir	Interior B.C.	Small increase though still at low population level.
Lithocolletis sp.....	Trembling aspen	Mayo Road Liard River	Numerous and conspicuous.
Archips cerasivoranus (Fitch)....	Cherry	East Nelson District	Increase in the number of tents.

OTHER NOTEWORTHY INSECTS—concluded

Insect	Host	Locality	Remarks
Scoliopteryx libatrix L.	Willow	Albreda to Avola on North Thompson River	Caused noticeable defoliation along roadside.
Datana ministra (Drury)	Birch hawthorn saskatoon	Southern Interior	Localized severe defoliation.
Asemum atrum Esch.	White spruce	Summit Lake	Moderate infestation in blowdown.
Monochamus maculosus Hald.	Ponderosa pine	Vernon	Heavy emergence of adults from 1960 fire-killed trees.
Ips oregoni (Eichh.)	Ponderosa pine	Grand Forks	12 trees showed new top-killing in 1961.
Adelges spp.	Sitka spruce, lodgepole pine, amabilis fir	West Prince Rupert District	Woolly aphid populations generally at the highest level in years
Pristiphora erichsonii (Htg.)	Larch	Interior	None were collected in 1961.
Lyonetia saliciella Busck	Willow	Nelson Forest District	Moderate to severe infestations.
Neoalcis californiaria Packard		Vancouver Island	Moths were exceptionally numerous in August.
Erannis vancouverensis Hulst	Vine maple, willow	Terrace Airport Road	First infestation of this species since 1959.
Paraplinthus carinatus Boh.	Douglas fir	Vancouver Island	Adults girdled and killed small seedlings in plantations. First record of damage in B.C.

PROVINCE OF BRITISH COLUMBIA

FOREST DISEASE SURVEY

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INTRODUCTION

Rust diseases figured prominently in the activities of the British Columbia forest disease survey in 1961. A large-scale survey was begun, enlisting the cooperation of public and private agencies, to investigate an apparently introduced Melampsora rust first found on yellow pine seedlings in 1960. This rust, morphologically indistinguishable from *Melampsora pinitorqua* Rostr., which causes pine twist rust in Europe, had not been reported previously in North America. So far this disease has not been found elsewhere in the Province, although it appeared again in 1961, in the vicinity of the previously infected test beds at Telkwa, B.C. The most significant finding of investigations in 1961 was that native trembling aspen is susceptible to infection by the rust.

A severe outbreak of sweetfern blister rust, caused by *Cronartium comptoniae* Arth., was discovered damaging young plantations of Bishop and Monterey pines on Vancouver Island. This rust, native to the region, had never been recorded previously on these two non-indigenous hosts. The discovery makes doubtful the future success of these two pines in the region and stresses the need for extra vigilance to prevent the introduction of *C. comptoniae* to other regions of the world.

A special survey of willow blight, another introduction to British Columbia, was carried out following confirmation of this disease in the Vancouver area in 1960, after having been unreported since 1941. The present survey found the disease to be widespread throughout the Fraser Valley but it was not reported elsewhere.

The excellent cooperation received from cooperators and the general public in surveys of the pine twist rust is gratefully acknowledged. Special thanks are due to the Columbia Cellulose Company, Western Tree Farms Limited, and the British Columbia Forest Service for their support.

The 1,653 disease collections submitted to the survey in 1961 are listed below by host:

Coniferous trees	Collections	
Douglas fir		480
Pine		
Lodgepole pine	62	
Western white pine	39	
Red pine	22	
Ponderosa pine	10	
Scots pine	5	
Other pines	20	
		158
Fir		
Alpine fir	91	
Amabilis fir	23	
Grand fir	10	
		124

Broad-leaved trees	Collections	
Poplar		
Trembling aspen	150	
Black cottonwood	19	
White poplar	19	
Other poplars	25	
		213
Willow		101
Alder		
Red alder	21	
Sitka alder	10	
Mountain alder	4	
Other alders	11	
		46

Coniferous trees	Collections		Broad-leaved trees	Collections	
Spruce			Ash, mountain		17
White spruce	50				
Sitka spruce	15		Birch		
Engelmann spruce	14		Western white birch	15	
Black spruce	5		Dwarf birch	6	
Other spruces	6		Other birches	10	
		90			31
Hemlock, western		83	Maple		
Juniper			Broadleaf maple	5	
Rocky Mountain Juniper	16		Douglas maple	2	
Common juniper	14		Vine maple	2	
Other junipers	20		Other maples	2	
		50			11
Cedar, western red		10	Cherry		5
Larch			Arbutus		2
European larch	7		Oak, Garry		1
Western larch	1				
Other larches	4		Total		327
		12			
Total		957			

Miscellaneous or host not specified 269

GRAND TOTAL 1,653

IMPORTANT DISEASES

Weather Injury—There were few reports of weather injury in the Province during 1961. Scattered reports of light to moderate frost damage to alpine fir and lodgepole and jack pines in northern British Columbia and the Yukon Territories appear to represent a chronic situation involving frost pockets.

An area of severe bark beetle (*Dendroctonus pseudotsugae* Hopk.) mortality surveyed in the Farwell Creek drainage, 35 miles west of Williams Lake, was attributed to predisposition by frost injury during the winter of 1952-53. It could not be determined what proportion of the dead trees resulted from direct injury by frost. Similar damage was noted in this general area in 1956 and was also attributed to frost and subsequent bark beetle damage.

Foliage Diseases—There was no overall climatic influence indicated in the behaviour of foliage diseases during 1961. Needle blight of yellow pine caused by *Elytroderma deformans* (Weir) Darker, continued at outbreak levels in all areas heavily infected during the last three years. Only minor fluctuations in disease intensity occurred and there was little indication of spread outside the previous boundaries of the outbreak. Light mortality among understory trees continued and measurable losses in increment may be expected in the heavily defoliated trees.

The severe outbreak of Douglas fir needle blight, caused by *Rhabdocline pseudotsugae* Syd., subsided following two successive years of weather conditions unfavourable to spore dispersal.

Hypodermella laricis Tub. caused moderate to heavy foliage killing of western larch in a number of localized areas, but infection was generally less evident than in previous years.

There were reports of severe but sporadic defoliation by foliage rusts from the northern half of the Province.

Pine Twist Rust—A Melampsora rust indistinguishable from *Melampsora pinitorqua*, the cause of pine twist rust in Europe, was discovered infecting seedling yellow pine at Telkwa, British Columbia, in 1960 (Ziller, W. G. 1960. Pine twist rust (*Melampsora pinitorqua*) in North America. Plant Dis. Reptr. 45(5): 327-329.). This discovery was the first record of a Melampsora rust infecting pine in North America, and the first record of the rust on yellow pine. Telkwa is situated about 400 miles northwest of the natural limit of yellow

pine. The seedlings in the infected test bed were destroyed, although it was thought highly improbable that the disease would be eradicated by this procedure. The implications of this possible introduction made an early examination of the problem necessary.

A large scale and intensive survey was begun in 1961 to trace the source of pine infection at Telkwa and, if possible, the source of initial infection; to determine the host range of the rust in British Columbia; and to determine the distribution of European white poplar (*Populus alba* L.) which was the only known poplar host of *M. pinitorqua* within the effective range of the infected seedlings for basidiospore dispersal. The results of the survey in 1961 are summarized below.

The rust appeared again in 1961 on freshly germinating seedlings of yellow pine set out in suspect areas. It appeared only at Telkwa in approximately the same location as in 1960, although the seedlings were placed out at Terrace and in the Fraser Valley, which were also designated suspect areas. In addition to those placed out in seed flats, planted and naturally-occurring yellow and other pines were examined in the vicinity of white poplars throughout the Province, but the rust was not found on pine outside Telkwa.

Inoculation tests with aeciospores obtained from the infected pine at Telkwa gave positive results on the native trembling aspen and negative results on European white poplar, consistently in three replications. The negative results are not considered conclusive.

A series of controlled infection tests on Douglas fir and yellow pine with basidiospores obtained from over-wintered trembling aspen leaves near the infection site at Telkwa gave positive results on the fir and negative results on the pine. These studies were completed in June, two weeks before the appearance of natural infection on the pine. The results would confirm the suggestion that the rust on the over-wintered aspen leaves was *Melampsora albertensis* Arth. They would not, however, preclude the possibility that another rust, with later developing basidiospores was also present and carried infection to the pine. Aspen appears to be the source of pine infection at Telkwa.

The survey of the distribution of European white poplar included observations on this host for the presence of Melampsora rust, but only one instance of Melampsora infection on white poplar was found, at Hope, B.C. It was not possible to associate this rust with that causing the pine infection at Telkwa. Yellow pine seedlings placed near this tree did not become infected during the summer. Infection studies on 46 species and varieties of poplars inoculated with urediospores obtained from this tree gave positive results on European white poplar, trembling aspen, the hybrids *Populus nigra* x *trichocarpa*, and probably *P. candicans* x *berolinensis* (identity of this host requires verification), and the poplar variety 'Gelrica'. The negative results obtained on the remaining test trees are not considered conclusive. The rust on European white poplar at Hope, was tentatively identified as *Melampsora populnea* (Pers.) Karst. because of the host, keeping in mind that it can not be distinguished from *M. albertensis* on the basis of the existing knowledge of this group.

European white poplar was found to be quite generally distributed throughout the populated areas of the Province, having been widely planted as an ornamental. It was found to be particularly numerous throughout the yellow pine zone, the Fraser Valley, and on Vancouver Island. This species has not been demonstrated to be a host of the pine rust found at Telkwa. Furthermore, since it has a much more restricted distribution than trembling aspen, which was shown to be highly susceptible to the rust, it would have a relatively minor role in the spread of the disease, even if it should later prove to be susceptible.

At this point little can be said about the distribution of the yellow-pine-infecting *Melampsora* found at Telkwa because it cannot be distinguished on its poplar host. It is encouraging that it has not been found on pine elsewhere in the Province, although light infections may well have escaped detection on pine.

A number of important facts have come to light, but many questions remain to be answered. Determination of the species of rust on poplar by cross inoculations with basidiospores to pine at various times during the summer, and under various conditions, should throw further light on the subject. The absence of a morphological basis for the separation of the various *Melampsora* species and races on poplar appears to be the greatest obstacle in the way of rapid progress on this problem.

Willow Blight—Willow blight was confirmed in British Columbia in 1960 for the first time since 1941 (Bloomberg, W. J. and Funk, A. 1960. Willow blight in British Columbia. Can. Dept. Agr., For. Biol. Div., Bi-monthly Prog. Rept., 16(5): 3.). An intensive survey of the disease in 1961 in the Fraser Valley, and general observations for its presence throughout the Province revealed the disease to be widespread throughout the Fraser Valley on both sides of the Fraser River. To date it has not been found elsewhere in the Province, although there is no reason to expect that it should be confined to the lower mainland.

The hosts recorded in 1961 included golden willow (*Salix alba vitellina* (L.) Stokes) and weeping willow (*S. babylonica* L.). Both these hosts are commonly regarded as resistant to the disease, but damage to several infected trees of both these species in the Fraser Valley indicated that they were highly susceptible. Native willows in close proximity to diseased trees on the University of British Columbia campus appeared to be immune. The symptoms of the disease were characteristic, as described in the 1960 Report.

Examinations several times during the summer turned up both fungi of the complex reported to cause the disease namely, *Fusicladium saliciperdum* (All. & Tub.) Lind. and *Physalospera miyabeana* Fuk., but only the *Gloeosporium* (imperfect) state of the latter was found.

Willow blight does not pose a threat from a forestry standpoint, even though the causal fungi were introduced to the continent and the disease is a potential problem in the Midwest, where willow is used in flood control. In British Columbia, willow does not have much commercial value, nor does it play an important role in flood control. But, since many of the susceptible varieties of willow are widely planted as ornamentals, spread and intensification of the disease has some economic implications.

Diseases of Non-indigenous Trees—The examination of exotic pine plantations in 1961 revealed a severe outbreak of the native sweetfern blister rust caused by *Cronartium comptoniae* (Molnar, A. C. An outbreak of *Cronartium comptoniae* on Monterey and Bishop pines on Vancouver Island, British Columbia. Plant. Dis. Rept. 45: 854-855. 1961.). Five-year-old plantations of Monterey and Bishop pines sustained up to 95 and 75 per cent infection of the stems, respectively. Ten of the 12 Monterey pine and 5 of the 8 Bishop pine plantations were infected by this rust. Mortality was estimated at less than one per cent in all the infected stands but, since most infections involved the stem, heavy mortality may be expected in the future.

In the six plantations where these two species were planted together, Bishop pine invariably suffered a lower incidence of infection than Monterey pine, but this difference would not have any practical significance. The apparent resistance of cluster pine, which was present and free from infection in 8 of the 10 plantations containing infected Monterey pine was much more striking. Cluster pine is, however, recorded as a host of *C. comptoniae* (Boyce, J. S. 1943. Host relationships and distribution of conifer rusts in the United States and Canada. Trans. Conn. Acad. Arts Sci. 35: 331-382.). In another plantation, where 83 per cent of Monterey pine was infected, Austrian pine, cluster pine, and the hybrids, *P. echinata* x *taeda*, *P. murrayana* x *banksiana*, and *P. rigida* x *taeda*, were free from attack.

Bishop and Monterey pines are new hosts for *C. comptoniae* and the outbreak of infection recorded on Vancouver Island should caution against further planting of these pines in the region until more is known about the distribution of the alternate host, *Myrica gale* L., and other factors promoting outbreak conditions. Especial vigilance is indicated to prevent the introduction of *C. comptoniae* into regions of the world where Bishop or Monterey pines are valuable forest species.

Peridermium harknessii J. P. Moore, the cause of the western gall rust, has reached damaging infection levels in a Scots pine plantation in the lower Fraser Valley. This blister rust was also found infecting cluster and Monterey pines, which are new hosts for this fungus in Canada.

OTHER NOTEWORTHY DISEASES

Host	Organism	Locality	Remarks
Alder, red	*Fomes annosus* (Fr.) Cooke	Mesachie	Fruiting in root crotches and causing the uprooting of a 6-inch-DBH alder tree. Rarely attacks broad-leaved trees. Probably the first world host record of its occurrence on red alder.
	Tympanis alnea (Pers.) Fr.	Halfmoon Bay	Associated with dieback. First herbarium record.
Aspen, large-toothed	*Melampsora albertensis* Arth.	Vancouver	Causing severe foliage rust. Probably the first world host record.
Aspen, trembling	*Melampsora* sp.	Yukon Territory: Dawson, Beaver Creek, Watson Lake, Teslin	Causing foliage rust, light damage. The rust is probably *M. medusae* Thüm., causing a needle rust of larch, its alternate host. First record for Yukon Territory.
Birch, scrub	*Melampsoridium betulinum* (Fr.) Kleb.	Yukon Territory: Dawson, Beaver Creek	Causing light to medium damage to the foliage. Not yet found on larch, its alternate host, in western North America. First host record for Yukon Territory.
Birch, western white	*Fomes igniarius* (L. ex Fr.) Kickx	Yukon Territory: Dawson, Teslin, Mayo	Causing white trunk rot of living mature trees. First host record for Yukon Territory.
	Melampsoridium betulinum (Fr.) Kleb.	Yukon Territory: Dawson, Beaver Creek, Snag	Causing medium to heavy damage to foliage. First host record for Yukon Territory, although reported from Alaska.
Cedar, western red	*Polyporus hirtus* Quél.	Saanichton	Causing butt rot of coniferous trees, considered to be rare. First host record for B.C.
Cottonwood, black	*Macrophoma tumefaciens* Shear	Bella Coola	Causing globose galls on twigs of cottonwood. First record for B.C.
Fir, alpine	*Camarosporium* sp.	Prince Rupert	Apparently causing bud necrosis. A similar or identical parasite causing bud necrosis of Douglas fir (Ann. Rept. For. Ins. Dis. Surv. p. 109. 1959) has been under observation since 1955. First record for B.C.
	Melampsorella caryophyllacearum Schroet.	Calument, Y.T.	Causing witches' brooms. First record for Yukon Territory.
	Micropera sp.	Smithers	Associated with dieback. Identified from culture. First herbarium record.
	Peridermium holwayi Syd.	Yukon Territory: Dawson, Teslin	Causing needle rust, very light damage to mature trees. First record for Yukon Territory.
	Pucciniastrum epilobii Otth	Teslin, Y.T.	Causing needle rust, light damage to reproduction. First host record for Yukon Territory. Alternate host: fire-weed (*Epilobium* spp.).

Host	Organism	Locality	Remarks
Fir, Douglas.....	*Polyporus balsameus* Peck	Victoria	Causing brown butt rot of coniferous trees. First herbarium host record.
	Poria nigrescens Bres.	Vancouver Island	Causing decay of coniferous and broad-leaved trees. First record for B.C.
	Wallrothiella arceuthobii (Peck) Sacc.	Creston	A hyperparasite of the Douglas fir mistletoe, suppressing seed production of the mistletoe plant and therefore beneficial to forestry. First record of its occurrence on *Arceuthobium douglasii* Engelm. in B.C.
Hemlock, western.....	*Diplodina* sp.	Cameron	Associated with branch canker and dieback. First host record for B.C.
	Retinocyclus olivaceus Fuckel	Terrace	Associated with branch canker. First host record for B.C.
Pine, cluster.....	*Peridermium harknessii* J. P. Moore	Coombs	Causing gall rust on branches of seedlings in a small forest plantation. Lodgepole pine diseased with gall rust grew in the vicinity. First host record for Canada.
Pine, Monterey.....	*Peridermium harknessii* J. P. Moore	Coombs	See remarks for cluster pine, above.
Pine, sugar.....	*Cronartium ribicola* J. C. Fischer	Campbell River	Causing blister rust on the stems and branches of seedlings in a plantation. First herbarium host record.
Pine, white-bark.....	*Polyporus leucospongia* Cooke & Harkn.	Creston	Causing brown cubical rot of sap- and heartwood. First record in Canada.
Plum, cherry.....	*Ganoderma applanatum* (Pers. ex Wallr.) Pat. var. *brownii* (Murrill) Humphrey & Leus	Victoria	Causing white mottled rot on living, mature, cultivated tree. First host record and first record of the variety in Canada.
Poplar, balsam.....	*Venturia populina* (Vuill.) Fabric.	Haines Junction, Y.T.	Causing leaf and twig blight of balsam poplar. First record of the fungus occurring in western North America. Ref.: Can. Jour. Botany, 39: 875–890. 1961.
Poplar, white.....	*Melampsora* sp.	Hope	Causing leaf rust. The identity of this rust could not be determined until the alternate host has been found by inoculation experiments scheduled for 1962. If the alternate host proves to be pine, the rust fungus is probably *Melampsora pinitorqua* Rostrup. First record of a rust fungus occurring on white poplar in Canada.
Spruce, Colorado.....	*Chrysomyxa pirolata* Wint.	Smithers	Causing cone rust and total destruction of the seed crop. First world host record.
Spruce.....	*Chrysomyxa arctostaphyli* Diet.	Throughout B.C. and Y.T.	It has recently been demonstrated (Science, 134: 468–469. 1961) that the fungus causing yellow broom rust of spruce (*Peridermium coloradense* (Diet.) Arth. & Kern) is the aecial state of a leaf rust on kinnikinick (*Arctostaphylos uva-ursi* (L.) Spreng.) caused by *Chrysomyxa arctostaphyli*. Hence, *C. arctostaphyli* is now the appropriate name for the broom rust of spruce.

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